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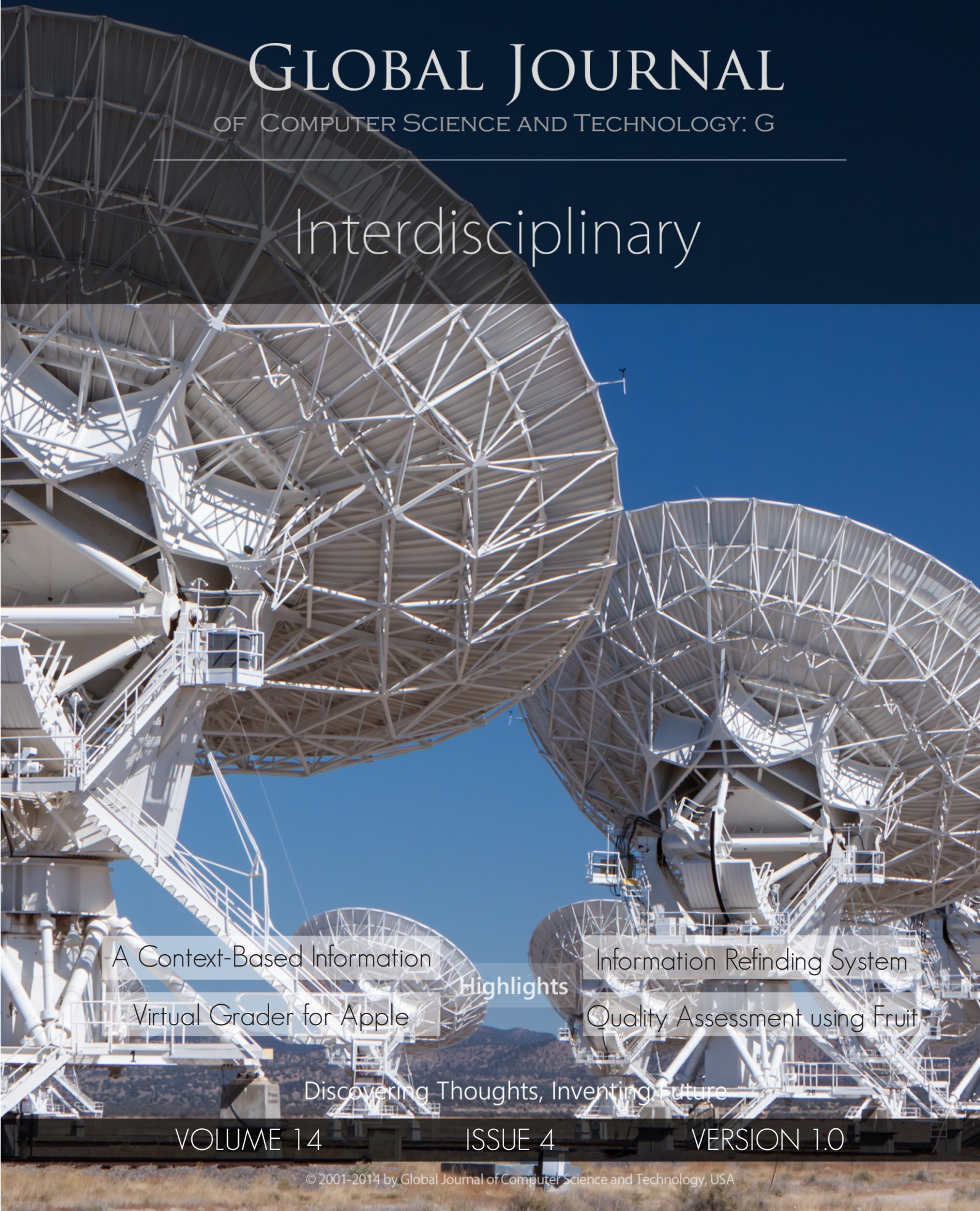

Highlights

A Context-Based Information Virtual Grader for Apple

Information Refinding System Quality Assessment using Fruit

Discovering Thoughts, Inventing Future

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A Context-based Information Refinding System-A Review

By Divya, M. Janga Reddy & M. Riyajoddin
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Abstract- In recent technological development people are experiencing unprecedentedly data explosion, reading, writing, and collecting different kinds of information from local computer and the global Web. As such most of the times during web search peoples revisit information that have ever been come across occasionally or intentionally. But in most of the cased users do not know enough information, while refinding is a more directed process as users have already seen the information before. A general way to support information refinding is to maintain access logs, recording what users have ever seen based on their revisit frequencies. This survey paper gives the different techniques for context based information refinding systems with intent to give the direction of the my project work with improved context based information refinding system.

Keywords: information refinding, context cue, refinding queries.

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Divya [α], M. Janga Reddy [σ] & M. Riyajoddin [ρ]

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I. Introduction

The World Wide has been dramatically increased due to the usage of internet. The web acts as a medium where large amount of information can be obtained at lower cost. Web mining can be defined as the discovery and analysis of useful information from the World Wide Web data. It is one of the data mining techniques to automatically extract the information from web documents. WWW provides a rich set of data for data mining. The web is dynamic and very high dimensionality. A web page contains three forms of data, structured, unstructured and semi structured data. Data sets available in the web can be very large and occupy ten to hundreds of terabytes, need a large farm of servers. The user are collecting different kinds of information from the global web for both read and writing purpose. In the global web, search is an important activity then only considered to an email. Tremendous growth of web, every second millions of information added in the global web. Users are finding and refinding the web information in the global web everyday [9]. People revisit the information that have ever been come across occasionally or intentionally. Refindng web pages is typically better than to initially finding the webpage. Achieving efficient and accurate information retrieval is a challenging task. Refinding is a common task is difficult when previously viewed information is modified, moved or removed. How information refinding is different from information finding? There is a uncertainty in the later process because users do not know get enough information, while information refinding is a more directed process as users have already seen the information before. Information refinding is not the process of finding again [7]. A general way to support information refinding is to maintain access log[10], recording what users have ever seen based on their revisit frequencies. When refinding, users might prefer to have a search the results prioritized by pages that have been seen before. One way to refinding the information using contextual cues [3][2], inspired from the human memory approach.[8].

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II. Related Work

The people use lot of keywords to search the information. To remember the keyword after a few months ago what we have seen before it is difficult and time consuming task. Because original queries were wrongly remembered most of that time due to their loss of memory. According to cognitive science literature, human memory is predicted on contextual cues to refinding the information.

To get the information for users query exactly even a month or year ago hard to remember that keyword. But the time, place and concurrent activity associated with the happening of that access event may leave a deeper impression. Contextual information could helps as powerful clues to remember the key word. Contextual clues helps to users have seen the already viewed information.

Nivethitha (2014) suggested a query analysis for efficient context-based information refinding and page ranking system. Refinding what have done before is a common behavior of human in real life. According to the human natural recall characteristics, users allow to refinding web pages which have seen before. Psycological studies show under which information was accessed can helps as a powerful cue for information recall. Here context including time, place and concurrent activity could serves as a useful information recall clues. In this system not only considered finding the refinding queries. But also implement feedback system, so that webpage can be ranked by the multiple user feedback.

Deng et.al. (2013) have worked extensively and suggested a effective method for refinding the information fro m the web, they could not remember the

keyword and their related information after a couple of months. It based on the human recall characteristics, allows user to refinding WebPages according to the previous access context. The system was implemented offering some contextual information on the query results. Memory context is also considered in personal information refinding. Based on Inspiration from human memo ry mechanism, the context - based refinding framework was developed.

Won et.al. (2009) experimented in their work and identified that most modern web browsers offer web history functionality few people use it to revisit previously viewed web pages. In this paper they developed Contextual Web history (CWH), which improves the visibility of the history feature and greatly reduced the time and effort required to find and revisit webpage.CWH goal is to improve the usability and utility of the history feature in web browsers. CWH provides a richer set of clues about the content of the page, including time of visit, visual appearance and text search and quickly find previously visited web page again. Revisiting is a key part of web browsing. Contextual web History gives to understand the right set of basic features to support the process of re-finding information very fast.

Tasks	Potential Memory Cues
Recall	color, structure, time visited, logos , content, title, url of the web page
Recognition	Size of the thumbnails

MacKay et.al.(2005) had done a detailed analysis and present an extension to traditional bookmarks called landmarks, a user-directed technique that aid users in returning to specific content within a previously visited webpage. The use of traditional bookmarks allows users to return to a previously visited page, it can be hard to re-find facts within that page. Here we investigate the efficiency of land marks for refinding of information on web-pages. Land mark allow users to mark information on a webpage that they may want to return to a later date by highlighting the text and adding a landmark in the same fashion as they would a favorite in IE. Land marks are not meant as a replacement for the bookmarking facility but as an enhancement that help users return directly to previously visited information, giving context to the marked pages.

Hailpern et al. (2011) found that during recall tasks, contextual cues are important component of human memo ry. In this paper they present new interaction technique, pivoting, that allows users to search for contextually related activities and find target piece of information. You Pivot demonstrates how principles of human memo ry can be applied to enhance the search of digital information. Contextual cues could be one way to improve in formation recall in our digital lives. You Pivot used the calendar entry's lifespan as the pivot time period. Time Marks allowing a user to access all activity that was ongoing at a particular moment.

Parsons et.al. (2009) extensively worked and suggested a keyword-based information retrieval technique and suggested that the performance can be improved by re-ranking the results based on the context provided by the surrounding terms. A baseline technique was compared against two LSA techniques, and an analysis of the retrieved documents indicated that the re-ranking provided by the LSA techniques significantly improved the efficiency of the retrieved list. However, the participants' performance was not altered by the different techniques. Instead, the findings suggest that, when dealing with a small number of documents, participants will generally access all documents retrieved in a systematic manner. It is therefore hypothesised that the re-ranking technique would be more useful in a significantly larger document collection, where a thorough assessment of all documents is impractical.

This study has also emphasized the importance of assessing the impact of individual differences in any information retrieval system. For example, it was found that LSA did improve performance for participants with lower scores on the comprehension test.

Table : Comparison of Various Context-Based Re Finding Systems

Reference Number	Author	Paper Title	Issues	Method	Result (Refinding)	Drawbacks
2	A.P. Nivethitha	Efficient context based information re- - finding and page ranking	To build recall based query model to re-find the information using contextual cues and feedback visited by the user.	Re-finder and page ranking	Efficiently revisit of the web page using contextual cues and multi user feedback.	All the user not given the feedback. So cannot ranking the webpage properly.
3	Tangjian Deng, Liang Zhao, Hao Wang, Qingwei Liu, and Ling Feng	Refinder: A context-based information refinding system	To build query-by context model, Context are the powerful cue (place, time, concurrent activity) for information refinding.	A context based Re-finder	On average 15.53 seconds are needed to refinder complete the refinding request and 84.42 seconds with other existing methods	In Refinder, not implement user feedback for visited web pages
4	S. Won, J. Jin, and J. Hong,	Contextual Web History: Using visual and contextual cues to improve Web Browser History	To develop Contextual Web History (CWH) improves the visibility of the history feature helps people find previously visited web pages.	Contextual Web History	Greatly reduced the time and effort required to refinding the web pages.	In CWH, re-finding a webpage older than x days too many pages for the user to browse.
5	B. MacKay, M. Kellar, and C. Watters	An Evaluation of Landmarks for Re-finding Information on the Web	To implement Landmark which is an extension of traditional bookmarks. Landmark is a user-directed technique that aids users in returning to specific content within previously visited webpage	Landmark	Using Landmarks revisit the webpage significantly faster.	The users can only make landmarks for textual information, not expand this functionality to include images and other media.
6	J. Hailpern, N. Jitkoff, A. Warr, R. Karahalios, K. Sesek, and N. Shkrob	You Pivot: Improving Recall with Contextual Search	To allow users to search for contextual related activities (using time marks) and find a target piece of digital information.	You Pivot	Using You Pivot greatly improve the quality and speed of recall	Users own contextual cues is difficult to design
7	Kathryn Parsons, Agata McCormac, Marcus Butavicius, Simon Dennis* and Lael Ferguson	The Use of a Context-Based Information Retrieval Technique	The aim of this study was to examine whether the results provided by a keyword based technique would be improved through the use of two LSA techniques.	Latent Semantic Analysis (LSA)	This study therefore highlights the importance of testing the influence of individual differences on any IR system, and the importance of testing any IR tool on a population that closely reflects the intended users of the system.	LSA are unlikely to be necessary in relatively small document collections

III. Conclusion

We have studied the comparison of various papers of context based information refinding. The aim of this study was how the results of the information retrieval technique to efficiently refinding the web information could be improved by contextual cues shown in above table.

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Virtual Grader for Apple Quality Assessment using Fruit Size and Illumiation Features

By Ajay Pal Singh Chauhan & Amar Partap Singh
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Abstract- The present paper reports on the development of an intelligent virtual grader for assessing apple quality using machine vision. The heart of the proposed virtual grader was executed in the form of K-Nearest Neighbor (K-NN) classifier designed on the architecture of Euclidean distance metric. K-NN classifier is executed for this particular application due to its robustness to the noisy environment. The present study revealed that fruit surface illumination is one of the major deterministic parameters affecting accuracy substantially while assessing apple quality based on fruit size. The performance of the proposed virtual grader was examined experimentally under different conditions of fruit surface illumination. An industrial grade camera connected to an image grabber was used to implement the proposed industrial-grade virtual grader using machine vision. Results of this study are quite promising with an achievement of 99% efficiency at 100% repeatability when fruit surface is exposed to an optimal value of 310 lux. However, such an attempt has not been made earlier.

Keywords: *classifier, machine vision, intensity, perimeter, hydraulic radius.*

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Ajay Pal Singh Chauhan [α] & Amar Partap Singh [σ]

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I. Introduction

Food Industry is one of the industries in which packaging of agriculture produce is an important task that largely depends upon grading methods. Therefore, grading of agriculture produce is required to be very fast & accurate as far as the quality of produce is concerned. In order to accomplish this task, highly efficient algorithms are needed invariably in machine vision based inspection systems. The basis of fruit gradation is external factors including size, shape, color, defect and external damage, etc. However, consumer choice is always to have fruits with equal size. In fact, this is the basis of sorting of fruits based on their size. Proper sorting of fruit ensures uniformity in fruit size, reduce packaging and transportation costs and also provides an optimum packaging configuration. Thus in packaging industry, grading of fruits based on size is one of the important tasks that are performed. Though human graders can do this task but machine vision has proved to be a great tool that can replace human sorters for consistent and reliable judgment in estimating and comparing size of the fruits. Human graders may make different judgments on the same product at different instances and also if done by human graders it will be time consuming also. Therefore, in order to replace human graders, machine vision is the most effective and non-destructive evaluation technique. Assessment of apple quality based on its size is highly subjective due to a number of factors that may influence the crop maturity during cultivation such as geographical location, weather conditions, rainfall density, nurturing ingredients, disease and industrial effluence, etc. Due to highly subjective nature of the apple quality, it is indeed extremely difficult to make any benchmark or standards for size-based quality assessment. Most of the fruit packaging industries, in fact, largely depend upon the decision of the human experts in assessing or assigning the grade to a particular size of the apple. However, manual grading is obviously a very cumbersome process as far as efficiency and accuracy are concerned. In order to circumvent these difficulties, machine vision based intelligent systems are required urgently to replace human graders for assessing fruit quality. An attempt is made in the present work to replace human grader with a virtual grader for assessing the apple quality based on its size using machine vision. The knowledge or intelligence acquired by the human grader with experience in grading apple based on its size is, in fact, imbibed artificially in the proposed virtual grader. Different algorithms had been developed for size determination of fruits, cereals, vegetables and food products under the realm of image processing in the past, which are detailed below.

Emphasis on important aspects of image processing technique along with review of the most recent developments throughout the food industry was already reported [1]. Another review of recent work reported on food and agricultural products along with in depth introduction to machine vision system and its components was also available [2]. Different techniques for apple processing were studied and features such as hue angle, shape defect, circumference, firmness, weight, blush percentage, russet, bruise content and number of natural defects were defined [3].Reviews in the progress of computer vision in the agricultural and food industry was done and areas for further research and wider application of the technique were identified [4]. Correlation and regression analysis was performed in order to determine the relationships among fruit quality parameters [5]. Image analysis was done to distinguish Arthur from Arkan based upon different parameters namely perimeter, area, length, feret diameter but proper positioning of kernels was

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mandatory [6]. Pattern recognition was employed to discriminate between wheat and nonwheat and between weed seeds and stones in nonwheat part of grain samples but manual orientation of kernel was required [7].Fast Fourier transform analysis was derived from Fourier harmonics in conjunction with machine vision system for potatoes size inspection based on elongation ratio [8]. To classify several cereal grains, size and shape features including kernel length, width, projected area and aspect ratio were used [9].Fourier descriptor technique [10], a method of using boundary radius and its Fourier transform to spectrum domain, was studied for size description.

A color vision sorter capable of performing full color spectral sorting of different varieties of fruits and vegetables including apples, peaches, tomatoes and citrus was developed for color, size and shape, with a capacity of up to 44 tons per hour [11]. However, much of the above work had not been used in commercial apple sorting systems because of the constraints in speed, accuracy and flexibility. Correct classification rates (CCR) were calculated from the confusion matrix. The overall accuracy was 94 %.Three methods were discussed for apple size determination by applying known geometrical models [12]. A simplified Machine vision system was developed for estimating size of pomegranates [13]. It allows the estimation of volume, surface area and weight of fruit using prediction equations developed from the relationship between projected area, shape and size. An automatic detection system for finding out surface quality parameters and defects of fruits like apples was designed [14].But this paper mainly deals with mechanical aspects. Image processing method with the disk approximation technique was employed to estimate the volume of cantaloupes of varying sizes from sets of two surface images captured with a digital camera [15]. Algorithm to grade papaya samples according to their size using estimated weight information with 90% classification accuracy was reported [16].A technique was developed using fuzzy sets to correlate the attributes of size, color, shape and abnormalities, obtained from tomato images, with the inner quality of the tomato samples [17].

Another automatic strawberry sorting system was developed [18] with average shape and size accuracies of 98 and 100%, respectively, regardless of the fruit orientation angle with judgment time within 1.18 s. Physical features of chocolate chip biscuits, including size, shape baked dough color, and fraction of top surface area using image analysis were measured and four fuzzy models were developed to predict consumer ratings based on these features [19]. Kohanz apple fruit area, perimeter and eccentricity were extracted by image processing to suggest an appropriate package design [20]. High Correlation between the maximum size and weight of fruit prove that the weight could become a proper quality index for apples [21].An algorithm for sorting lemon based on color and size was developed and implemented in visual basic environment [22]. The correct classification rates were 95.45 %, 100%, and 86.67% for grade 1, 2 and 3 respectively. A fuzzy image analysis method based upon size and color had been reported for mango fruit quality grading [23].The recent techniques and features of external grading systems for non-destructive operation and performance of automated quality verification systems for agriculture products were discussed [24].

After having rigorous literature review, it is concluded that above methods work well only for a particular quality of a fruit or vegetable or cereal with efficiency less than 100 % and also they fail to address the effect of an important parameter that is intensity of fruit surface illumination. However based on the successful results of these studies, the authors of present paper decided to estimate fruit quality based on size using K-nearest neighbor (K-NN) classifier while considering intensity as one of the important deterministic parameters. The performance of different variants of K-NN classifier is also examined at different values of fruit surface exposures by the authors of the present paper in their earlier work on quality assessment of red delicious apples using color features [25]. An intelligent virtual grader was also developed based on the architecture of Euclidean metric oriented K-NN classifier for estimation of quality of red delicious apples using color features [26]. Similarly, another type of virtual grader was also developed for assessing apple quality using shape features [27]. In line with this strategy, the use of K-NN classifier is extended in the present work to develop an intelligent virtual grader for estimation of apple fruit quality using size features. In fact, the work reported in the present paper is a part of the complete machine vision based apple gradation system for assessing apple quality using information related to fruit size, shape, color and surface defect.

II. K-Nearest Neighbor (K-NN) Classifier

The main goal of a classifier is to assign an object to a predefined class using the given features. Machine vision systems usually use specially designed digital image processing software to accomplish the task of classification. Size is considered to be one of the important factor on the basis of which grading of apple is done. K-NN algorithm is a widely used technique that found many applications in classification. In the present work, the concept of classification is extended to determine accurately the apple fruit quality based on its size. However, in some applications, it may fail to produce adequate results owe to lack of in depth knowledge in its implementation, yet the fact is that it is easy to fine-tune to a variety of situations because it has only one parameter, that is, the number of neighbors (k).

In fact, K-NN algorithm is a typical instance based learning method. Its basic idea is that an object is classified according to the majority vote of its neighbors, with the object being assigned to the class most of its k nearest neighbors belongs to. Though it has a number of invariants yet, in the present work, the Euclidean distance metric is employed for similarity computation. K-NN algorithm is described as illustrated here. Given a training set consisting of n pair (xi-yi), the algorithm firstly calculates the distance between the sample x and the training set, and then finds the closest k training samples. Thus x can be assigned to the class to which most of the k training samples are classified. The Mathematical formula to calculate Euclidean distance between samples is described by equation:

$$\text{Euclidean distance} = \sqrt{\sum_{i=1}^{k}(x_i - y_i)^2}$$

In k-nearest neighbor classification, size of the apple under consideration is classified into a class based on a voting mechanism.

III. Development of The Proposed Virtual Grader

NI Vision Builder for Automated Inspection was used in combination with LabVIEW to acquire images using experimental set up as shown in Fig 1. In the proposed experimental setup, image acquisition card, industrial grade BASLER sca-1390 17fc camera and ambient light source were used to execute a computer based machine vision system. The acquired images Fig 2 displays the block diagram of system overview including fruit under inspection, experimental setup and user interactive interface. However, systematic development of the proposed virtual grader involves following steps:

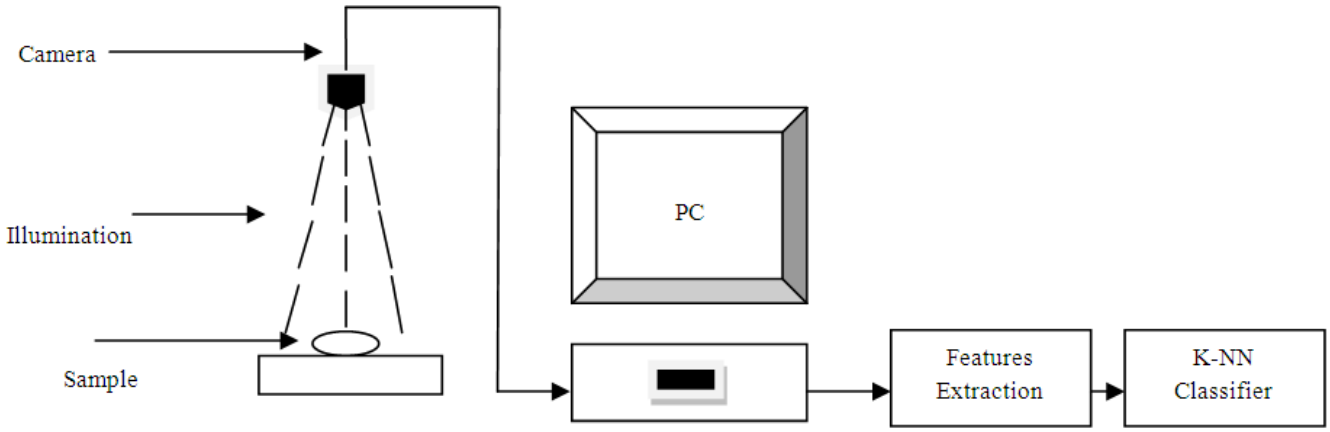

Figure 1: Experimental Setup

(a) (b) (c)

Figure 2 : System Overview Block Diagram (a) Fruit Under Inspection (b) Experimental setup (c) Virtual Fruit Grader

a) Front-Panel Synthesis

Front Panel was designed to serve the purpose of user interactive interface where actual inspection of apple takes place. The Front Panel was used to acquire the apple images automatically under the supervision of a specially designed algorithm of control and computations. After acquisition of the apple image, the Front Panel displays corresponding grade and other related parameters. The user-interactive Front Panel was designed in a fourth generation, object-oriented, graphical programming technology using Lab VIEW and was highly customized for this particular application. The different LabVIEW objects were carefully selected, researched, configured and interlinked to develop an elegant user-interactive Front-panel, as shown in Fig 3. The K-NN Classifier was executed using NI Vision Builder for Automated Inspection. The executed K-NN Classifier was then coded in the LabVIEW to get it integrated with the Front Panel. The source code for the complete action of the Front Panel was written as an Algorithm of Control and Computations in the form of Block diagram. The part of the Algorithm of Control and computation is shown in Fig.4.

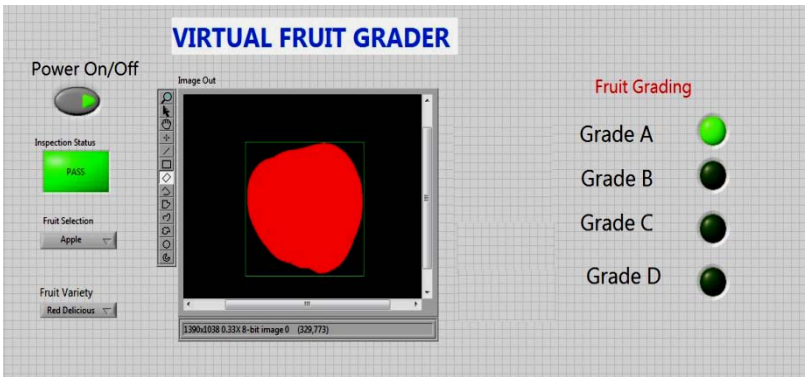

Figure 3 : User Interactive Front Panel

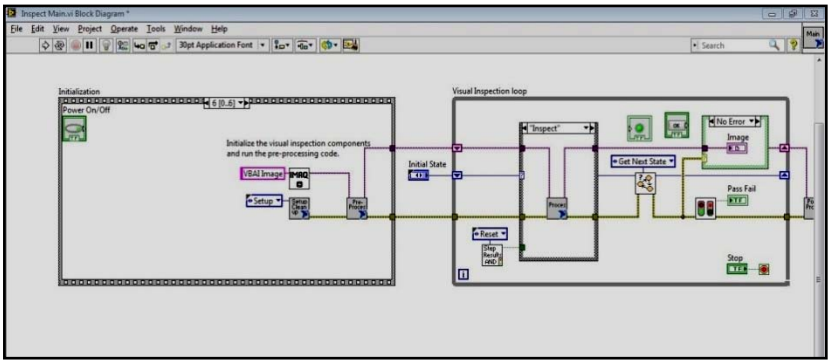

Figure 4 : A Part of the Control and Computation Algorithm (Block Diagram)

b) Implementation of the Size-Classifier

The image processing software, the heart of the proposed virtual grader, was executed in the form of a size-classifier using NI Vision Builder for Automated Inspection in combination with Lab VIEW. NI Vision Builder for Automated Inspection was chosen for the development of image processing software in Lab VIEW environment, as it provides an effective graphical user interface with interactive features. K-NN algorithm using Euclidian distance metric was used to execute the size-classifier. The size-classifier calculates the size features by carefully extracting the features from the acquired image and computes the statistical information associated with the size including perimeter and hydraulic radius. Fig 4 displays a part of the Algorithm of Control and Computations executed in the form of Block Diagram as back-end programming for the complete system. In fact, it decimates the main blocks into sub-blocks including pre-processing, processing, post-processing and classification. The algorithm of control and computations was designed and interlinked with the Front Panel after having careful choice of various objects available in the Vision Builder for Automated Inspection and LabVIEW. The algorithm of control and computations, in fact, controls and coordinates the functioning of various modules and objects used for the design of front Panel and Subpanels of the proposed virtual grader. For proper classification of the fruits under inspection, training and test interfaces were synthesized. The training interface was used to train the size classifier manually thus categorizing size samples into different size-classes. Similarly, test interface was used in the classifying as well as validation phases to examine the performance of the proposed virtual grader in an automated manner.

IV. Experimental Validation

The proposed virtual grader was designed to operate in a real time environment, however, in a highly user-interactive manner. Its operation was controlled under the supervision of specially designed Algorithm of Control & Computations executed in the form of block diagram as back-end programming.

a) Samples Preparation

Covering a wide range of size, two hundred apples of red delicious variety were taken. Three human experts trained in the field of size-based manual grading of this particular variety of apples were given the samples. So four grades A, B, C and D having 25 samples each was selected. Fifteen samples in each grade were taken as reference samples that were commonly agreed upon by all the experts. These samples were used for training the K-NN based size-classifier as per the following details.

b) Size Classifier Training

The inspection image contains multiple samples. These were fed to the executed size classifier for training. The proposed size classifier was executed on the architecture of K-NN algorithm powered with Euclidean metrics. The executed size classifier was operated in three phases including training phase, classifying phase and validation phase. A known sample consists of a region in the image containing the apple size that the classifier needs to learn. The size-classifier calculates a size features and assigns the associated class label to the computed features, for each and every sample added during the training phase. Eventually, all the trained samples added to the size-classifier were saved into a file which represents a trained size-classifier. After training the classifier, regions were classified into their corresponding classes for size identification in apple quality. The Region of Interest (ROI) toolbar was used to define a region which was useful for training. The Annulus ROI tool was chosen for apple, because it adjusts the inner and outer radii, and also adjusts the start and end angles. Experimentation was conducted using database of 60 training samples selected by three human experts, with 15 samples in each category and at five different intensities of apple surface illumination including 170 lux, 253 lux, 310 lux, 405 lux and 486 lux. However, the optimal number of training samples (k) and illumination intensity were determined after rigorous experimental trials using executed size-classifier. In the training phase, the size-classifier was provided with samples of each grade, that is, A, B, C and D varying from 1 to 15 respectively. In order to do so, in training phase, the size classifier was trained first with one sample of each grade and its performance was examined at five different illumination intensities of ambient light source (natural day light) taken at different instance of time. Then the experiment was repeated again fourteen times by varying sample of each grade from two to fifteen. From repeated experimental trials, it was established that the proposed size-classifier works effectively at an illumination intensity of 310 Lux when k-NN was trained with eight (k = 9) number of training samples, each with four different grades. It was also established that when the fruit under examination was not properly exposed with proper illumination intensity, the results obtained with the proposed classifier were less accurate. Reason behind this was that when light intensity varies ambient occlusion plays its affect. Ambient occlusion adds visual realism to the image without being physically correct. The effect of ambient occlusion can well be seen in the results presented in tables 1 and 2.The range of perimeter and hydraulic radius for a grade varies with intensity.

c) Size Classifier Testing

In the testing phase, all the 60 numbers of test samples selected by human experts for the training phase were again given to the proposed virtual grader one by one (choosing k = 9 and illumination intensity 310 lux), however, operated in an automatic mode, which classifies and grade them according to their size content. In the classifying phase, the size classifier calculates the size features of the sample that need to be identified and classifies it among trained samples using K-NN Algorithm. The classification process was responsible to classify the input or user selected fruit by using K-NN algorithm. This measure the distance between features values of the stored fruit under test. Afterward the K-NN finds out among the stored fruit the one having shortest distance with the input and identifies and assigns the class to the input fruit.

d) Size classifier validation

Again covering a wide range of size, one thousand apples of red delicious variety were taken. Three human experts trained in the field of size-based manual grading of this particular variety were provided each with the same number of samples to have an individual trial of each. After having individual judgment from them, they were each asked to choose 200 apples of each of the four grades out of a set of one thousand apples. Then out of these four sets, 100 samples in each grade were taken as reference samples that were commonly agreed upon by all the experts. In this way, four sets of fruits containing 100 fruits in each set were selected with corresponding A, B, C and D grades. In the validation phase, the selected 100 validation samples selected by human experts were given to the proposed virtual grader operated at illumination intensity of 310 lux and keeping k=9, which classifies and grade them according to their size content. Accordingly, the performance of the virtual grader was found to be quite satisfactorily as confirmed from the results presented in the following section.

V. Results and Discussion

The proposed virtual grader was used practically to estimate the quality of red delicious apple fruits based on their size. In order to examine the performance of the proposed virtual grader, it was brought in the operational mode by switching it on. In operational mode, the size-classifier operates in the classifying phase while acquiring images automatically. As soon as the image of the apple under inspection was acquired, it automatically displays its grade along with other related parameters on the Front Panel. After having repeated experimental trials, it was found that the proposed virtual grader works effectively at an illumination intensity of 310 lux when K-NN classifier was trained with nine numbers of training samples. It had been found experimentally that the proposed virtual grader grades apples based upon their size accurately when tested with complete set of apples used for training and classifying phases. The results obtained in

the real time operation in the validation phase further confirm the results obtained in the training and classifying phases. In fact, efficiency achieved using proposed virtual grader is 99%, if manual grading is assumed to be 100% efficient as reference level. However this1% variation was due to subjective judgment of human graders in perceiving the apple fruit during manual grading, which of course, is inevitable. Moreover, the repeatability of the proposed system was found to be 100% as confirmed after rigorous experimental validation. Achievement of 99% accuracy at repeatability of 100%, established that Euclidean distance metric based K-NN classifier was an efficient method to translate human visual perception of grading the apple based on fruit size into machine vision. However, the manual grading was always manifested with subjective tolerance. This fact was also confirmed by three human experts chosen for manual grading. According to them, it was not possible for them also to decide the border cases.

Now, in order to establish empirically the reason for successful gradation of the apple fruit under inspection by the proposed virtual grader, using acquired fruit images, size features including perimeter and hydraulic radius were estimated using image processing algorithms implemented in the LabVIEW at different fruit surface exposures. Table-1 indicates the range for perimeter of the training samples computed at different intensities of apple surface illumination for grade A, B, C and D, respectively. Similarly, Table-2 indicates the range for hydraulic radius of the training samples computed at different intensities of apple surface illumination for grades A, B, C and D, respectively. From the results indicated in the tables, it is confirmed without any doubt that at illumination intensity of 310 lux, there is a clear cut distinction between different grades, when categorization is done based on perimeter and hydraulic radius. For other values of the ranges for hydraulic radius and perimeter, there is overlapping in the values thus making the confusion for the classifier to predict accurately. Due to this reason, it is established empirically that the proposed virtual grader predicts accurately the right quality of apple fruit using size features. Table-3 indicates range of perimeter and hydraulic radius at an illumination intensity of 310 lux for different grades of red delicious apple.

Table 1 : Perimeter Range at Different Surface illuminations for Different Apple Grades

Intensity (Lux)	Grade-A		Grade-B		Grade-C		Grade-D	
	Pixels	mm	Pixels	Mm	Pixels	mm	Pixels	mm
486	2485-2290	391-360	2321-1991	365-313	2067-1972	325-310	2023-1977	318-311
405	2413-2239	379-352	2277-1946	358-306	2010-1844	316-290	1857-1741	292-274
310	2347-2131	369-335	2141-1908	337-300	1902-1730	299-272	1736-1682	273-264
253	2329-2143	366-337	2103-1895	331-298	1965-1685	309-265	1743-1696	274-267
170	2361-1978	371-311	2025-1717	318-270	1883-1749	296-275	1679-1647	264-259

Table 2 : Hydraulic Radius Range at Different Surface Illuminations for Different Apple Grades

Intensity (Lux)	Grade-A		Grade-B		Grade-C		Grade-D	
	Pixels	mm	Pixels	Mm	Pixels	mm	Pixels	mm
486	184-176	29-28	171-152	27-24	143-136	22-21	149-140	23-22
405	186-168	29-26	168-155	26-24	166-148	26-23	145-127	23-20
310	165-158	26-25	156-149	25-23	138-128	22-20	130-121	20-19
253	164-151	26-24	154-146	24-23	153-131	24-21	135-129	21-20
170	160-144	25-23	148-136	23-21	140-120	22-19	126-113	20-18

Table 3 : Perimeter and Hydraulic Radius of Apple Fruit at 310 Lux Fruit Surface Illumination (Training Samples)

Grade	Perimeter Range		Hydraulic Radius Range	
	Pixels	Mm	Pixels	Mm
A	2347-2131	369-335	165-158	26-25
B	2141-1908	337-300	156-149	25-23
C	1902-1730	299-272	138-128	22-20
D	1736-1682	273-264	130-121	20-19

VI. Conclusion

A new type of virtual grader is developed to estimate apple quality from its size. The implemented system is used effectively in real time environment to grade red delicious apple using fruit size features. It has been established experimentally that Euclidean distance metric based K-NN Classifier achieves promising results for this particular application. It is also found that the efficiency is the highest at a particular value of illumination intensity as well as optimal number of

training samples. The lighting condition is one of the major factors that affect the results produced by the system. Different light exposures generate different results. The theoretical principles and practical design of the proposed virtual grader are described. The technique would be quite useful for other types of fruits possessing similar surface characteristics. In fact, the proposed technique has a potential future in the field of machine vision based inspection of agriculture produce.

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Articulations and Translations: Decentralizing Action in the Videogame

By Carlos Baum & Cleci Maraschin

Abstract- This study explores the relation between cognition and videogame Player Character. It uses the procedural rhetoric as its main approach, understanding the activity of playing through its inner processes. The relation player-character-game often appears described in terms of representation and identification. We however suggest that some concepts by Bruno Latour – such as articulation and translation – describe this relationship more accurately. They allow for a decentralization of a supposed origin of action, be it from the subject, be it from the machine. A less dichotomic way to describe such relation is presented at last, allowing us to think the playing experience as capable of reconfiguring both game and player.

Keywords: *articulation, translation, actor-network theory, cognition, player character.*

GJCST-G Classification: *I.3.0, I.3.3*

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Carlos Baum [α] & Cleci Maraschin [σ]

Abstract- This study explores the relation between cognition and videogame Player Character. It uses the procedural rhetoric as its main approach, understanding the activity of playing through its inner processes. The relation player-character-game often appears described in terms of representation and identification. We however suggest that some concepts by Bruno Latour – such as articulation and translation – describe this relationship more accurately. They allow for a decentralization of a supposed origin of action, be it from the subject, be it from the machine. A less dichotomic way to describe such relation is presented at last, allowing us to think the playing experience as capable of reconfiguring both game and player.

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I. Introduction

The relationship between games, computers and cognition can be traced back to the first computer, the ENIAC, described in its own time as an electronic brain. Alan Turing, who in 1936 formalized the concept of algorithm through the Turing machine theoretical model, understood artificial intelligence as the ultimate goal of computer science. Both him and his group of collaborators believed that if a computer was able to defeat a human being in a chess match that would be a very important step towards that goal. The appeal of the game was simple: even with very well defined rules and all possible game states traceable, and even if the computer could play a million matches per second, it would still need 10108 years to play all possible games. That being said, in order to beat an expert chess player the computer would have to be able to react and anticipate the player's movements in an intelligent way. By 1947 Turing had already developed chess software for computers[1] (DONOVAN, 2010).

With the development in 1962 of the Programmed Data Processor-1(PDP-1) – a 120-thousand dollar computer, the size of a car with a small monitor and a keyboard – in the Massachusetts Institute of Technology (MIT) the development of the first electronic game was made possible: Spacewar!. In it, two gamers control spaceships around a star and try to destroy each other. Although it was known only in the academy, Spacewar! became so successful that the Digital Equipment Department started to include a copy in each PDP-1 sold, and use it as favorable argument to reflect PDP-1's potential to reach all types of consumers. After a while Spacewar! unleashed a reaction that would ten years later lead to the first domestic game console: Magnovox Odyssey, and its commercially successful sports game Pong, a simulated table tennis game in which players control paddles simulating ping-pong rackets (Donovan, 2010; Newman, 2004; Wolf & Perron, 2003).

Until the beginning of the 80s the few publications that held videogames as object of study were aimed at fans and potential consumers. At the start of the 80s the first scientific publications came out, the majority of them aimed at designers and programmers. It's worth highlighting two of them: Mind at Play: The Psychology of Videogames (Loftus & Loftus, 1983) and Mind and Media: The Effects of Television, Computers and Video Games (Greenfield, 1984). Both stand at the beginning of a tradition of psychological studies about videogames, using tests and labs as their core methodology.

Historians (Newman, 2004; Wolf & Perron, 2003) agree, however, that it was not until the end of the 90s and beginning of the 2000s that game studies gained some recognition, and electronic games became the object of study of various fields of knowledge. Whereas the first studies compare electronic games to other medias, especially Cinema, game studies have been building an identity of their own by understanding the videogame as a media of unique traits that must be understood within the practices that are pertinent to it. The same way it is not expected that a Literature researcher will not read, it is not possible to research videogames without playing them (Squire, 2005).

Psychological or cognitive studies involving electronic games are not a novelty: works on motivation, memory and attention are among the oldest scientific publications about videogames. But the rise of game studies and their approach to videogames as interdisciplinary field where player and game design coexist is.

At the beginning of the decade these studies turned their focus to the cognitive operations within the

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1 Only in 1997 IBM's Deepblue was able to beat Russian player Garry Kasparov in a game divided into six matches with two victories, three draws and one defeat.

core of the videogame playing experience, such as problem solving abilities (Squire, 2006) in an individual or collective level (Steinkuehler, 2006); pattern-recognition abilities (Koster, 2005) and hypothetico-deductive reasoning (Gee, 2008). In this scenario, the videogames comes up as a field where these operations may be observed (Steinkuehler, 2008), or as metaphor to thought and abstraction (Gee, 2008).

Two elements come to the foreground and become important to this article. The first consists of thinking about how few studies there are exploring the role of the character in the playing experience and its relation to cognition (Kafai et Al., 2010; Lankoski, 2011) – although the player character (PC) is considered one of the most emblematic elements of electronic games (Newman, 2004). The second element regards the way these studies describe the relation between cognition and game, generally in terms of representation, identification and reproduction. We nevertheless suggest that some of Bruno Latour's concepts (2001, 2005a, 2005b) such as translation and articulation describe this very relationship more accurately.

II. Methodology

With the goal of thinking the effectiveness of the concept of translation and the symmetry to comprehend the relations between cognition and videogame we explore the playing experience in matches of a game called Defense of the Ancient (DotA), a massive multiplayer online battle arena game. DotA is a customized scenario created from the real time strategy game Warcraft III (Blizzard Entertainment (Firm), 2002), in turn inspired by another game, Starcraft (Blizzard Entertainment (Firm), 1998), called Aeon of Strife". In DotA each team of maximum 5 players must destroy a heavily protected enemy structure, called "ancient", that is located in an opposite side of the map. Players control characters called "heroes", and are aided by allies controlled by artificial intelligence, called "creepers". Throughout the matches players develop their characters and use "money" (gold) to purchase equipment.

This article is written based in one of its writers' field diary, describing 32 matches played in a period of four months, totaling approximately 80 hours of game time. We approach the game mainly though the concept of Procedural Rhetoric (Bogost, 2008), understanding videogames as systems able to create, through their rule set, models of processes that make space for the possibility of action. The rules simultaneously create what is and what is not possible within the game experience, the same time they give meaning to this experience. The images, symbols – the theme – such as gunshots, soldiers and swords describe only partially this game's expressive capacity. Meaning is built from the manipulation of the symbols available to the player obeying the rules of the game. We find the meaning of a game by exploring the possibilities of that space while playing. So much that this approach privileges the rule set, and questions narrative and visual speech as they articulate and interact to this set of rules.

We however come closer to the comprehension of Voorhees (2009), in the sense that it does not understand the processes of the game as fully comprised within the machine – in which case the player's role would be to just shoot or execute. We understand the process in a broader sense, involving mechanical operations, software protocols as well as player action. We analyze games while highlighting the relation between player and other game elements, understanding that the game is not only the co-authorship of designers, writers and programmers, but it is something that unfolds simultaneously to players' actions.

The gameplay derives from a basic set of rules implemented by a programmed code, but it remains rich and multiple because each player only realizes these rules in a virtual environment that seems to be open to nearly infinite permutations. The player does not look at the underlying code of the game, but to the audiovisual and tactic results derived from it instead.

> It did not take me long to realize there was little time between a creep wave and another, something like 30 seconds, and therefore it was necessary to act fast, before they grew enough in number to destroy my tower (Field Diary, Feb. 2012).

But this is not to say that the player read the algorithm that generates the creep waves, like "Enemy1.PositionX = PositionX+1". What is possible to realize is a mediated state generated by the code's performance (Nitsche, 2008).

III. Acting in the Videogame

The most crucial aspect to any cognitive activity always is the last possible connection of the technical outline, its most exterior layer. Players do not assign meaning because they understand the logics of the programming, but because they understand the functioning of the virtual world generated by it. The code itself remains hidden, unless there is an unexpected behavior or mistake. That being said we cannot state that the game code defines the space or the experience of the game. The programming code and the gameplay are different realms of experience, and there is no reduction between them.

Different from Cinema and its product, the film – which can be repeated and analyzed from a stability and linearity standpoint –, the electronic game only happens as the agency of both its programming code and the player. The game cannot be reduced to its static programming code, stored at a hard disk. Neither is this code the interaction layer between game and user. The

game only exists while action, as a process; in the absence of action, what remains is a code stored in a magnetic disk (Galloway, 2006).

But how to define a statute of action on digital games? At the same time a team of players act, the software is executed. Player and computer participate together of the match, step by step, in such a way that both are indispensable for the game to happen.

The goal in this initial moment of the match is to kill enemy creeps, and mainly avoid getting killed by your opponent's heroes. Every time a hero kills a creep or destroys an enemy structure they acquire experience points (xp). Accumulating xp allows players access to new abilities; and to gold, which allows them to purchase equipment – which in turn improve existing character abilities or traits. The long-term goal is to become more capable than your opponent, so that it can be killed (or almost killed, and has to run away). With a free lane of enemy heroes it is possible, temporarily, to kill a larger amount of enemy creeps, and to move your creep wave towards enemy field. To win the game players must destroy their opponent's "Ancient". (Field Diary, Feb. 2012)

The player takes control of heroes, and makes way for his horde to move forward. Although it is possible to distinguish actions coming from the computer and from the player, such division is artificial. When a player teams up with creeps in order to destroy an enemy tower both cause damage to the same source, in a way that damage is inseparable. Machine and operator act together, in a cybernetic relationship to perform various game actions. They recurrently exist as a unique phenomenon. Even if they can be distinguished for the sake of analysis, they must be understood in a symmetric way, that is, with no privileges for either side.

Each game action is only possible through an association of all agents involved. That includes the player, availabilities of the virtual environment, and images and texts made available by other players, so that the player is, in a way, capacitated, authorized by the other agents involved. Action, as one might think, is not an exclusively human property, but rather the property of a group of agents. As Latour (20001) exemplifies, the B-52 does not fly, the American Air Force flies. That happens because flying is the property of an association of entities that include airports, airplanes, ticket counters and launch pads. Each one of these entities exchange competences and add to new functions and possibilities. The subject is no longer *"(…) the source from where action comes, but is in turn the mobile target of a big array of entities swarming in the subject's direction."* (Latour, 2005b, P. 46)

After spotting an enemy creep wave, attack is necessary; the destruction of the opponent wave allows for the allied wave to move forward. Once the allied wave advances towards an enemy hero then that hero must deal with the situation before attacking any other player character, which in turn allows for that player to attack first.

So the player's actions disturb the homeostatic state of the game. That happens because without such attack both creep waves would annihilate one another, always in the same place. The game state shift calls for a compensatory conduct of the player – no longer attacking creeps in order to attack enemy heroes –, and this compensatory conduct acts as a source of disturbance for the game and for the other user; this user acts as a source of disturbance for the game and other users, and so on indefinitely until the state necessary to the end of the game is reached.

Some authors (Bogost, 2008; Galloway, 2006), while examining the relation electronic game-player, suggest that the gameplay should be understood as the player's attempt to simulate the game's algorithm, the set of rules that govern the simulation. Through a simple repetition of gamer input + game output = result, in a loop, the player would continuously come closer to the ideal action, until he reached the result predicted by the algorithm.

We assume here that playing videogames is something a lot more complicated than that. The fact that a player might know that every thirty seconds a new creep wave comes up does not mean that the player knows or is able to recognize the formula that produces these creeps on screen. The notion that the player's experience and the game's programming directly overlap may be questioned once we consider the very own action of playing. The gameplay is not a mirror for the game's set of rules, but rather a consequence of the game's and the player's dispositions.

The concept of magic circle (Huizinga, 1971) – a space-time constituted by a set of specific rules that demand a certain disposition and conduct code from the player – is often brought up to describe a situation from the player's "real world". The idea of this circle, however, might mistakenly lead to the idea of a simple circular repetition. An alternative approach (Arsenault & Perron, 2009) would be to understand the game as a set of spiral circles, however not of action and reaction, but of pure reaction instead. The player reacts to the game state, which in turn reacts to the player's action. These circles gradually expand the player – it is not the game itself that is expanding, because its algorithm and its data are stored in a hard drive; it is only the gameplay, the set of possibilities that expand – as well as the player's actions and knowledge.

When we understand the importance of player's and game's actions in a symmetric way we realize that this relation takes place in a level above the generating algorithm. This relation happens in the digital world generated by this algorithm, with its availabilities and limitations, but it cannot be reduced to it. Thus learning a new game does not mean to simply and adequately

internalize its code: it means to give body to the set of relations between possible actions and scenario possibilities thorough action (Gee, 2008). In order to maintain the principle of symmetry we must also describe how it is possible to think this relation from the machine's side, in a way that is not strictly representational. Therefore we will examine the relationship player-avatar to demonstrate how the concept of articulation (Latour, 2001) describes it in a more precise way.

IV. Goblin Technology

A fairly recurring description (both in literature and common sense) is that the avatar represents the player in a virtual world. Kafai and col. (2012), for instance, describe the use of the avatar as an opportunity for youngsters to create various self representations, and reinterpret themselves to other players. Players are thinking centers, transmitting wills through their console or keyboard, and the avatar's function is to mimic these wills, and to allow other physically distant players to understand them. Or even that the character's image evokes a form of projective identification through which subjects fantasize about a body they would like to possess. On the other hand, a more detailed examination reveals that the function of the avatar is not exactly to represent the action of a player.

> DotA has 104 characters, divided into two factions: each character possesses four different abilities, and every time the character levels up it can enhance one of these abilities. The character also carries 6 items that may be purchased throughout the game, of a total of 128, elevating the number of possible combinations to an astronomical level. After few unsuccessful matches, I go to an official DotA forum (www.playdota.com), in a specific section called "Guides", and as the title suggests, I find many guides written by other players providing guidelines for beginners like me. After some reading it seems to be a consensus that the character called Goblin Techies is accessible to beginners.
> (…)
> Techies seems relatively easy; indeed, their attack hits distant enemies, and that seems safer than facing my opponents with swords and spears. I can also plant landmines that explode when an opponent is near; set stasis traps that stun the opponent; commit suicide, although I am not sure what is the use of that yet; and plant remotely controlled mine, that only activate when triggered by me (Field Diary, Mar., 2012).

When clicking a certain part of the screen with the left mouse button, the Goblins start to walk in that direction. A simple keyboard command (Ctrl+h) makes them plant a bomb. Clicking the right button directly over an enemy makes my character shoot a flaming catapult of sorts. While sitting in my room hitting the keyboard and clicking the mouse I personally did not walk, neither plant bombs nor shot a catapult. And still, we cannot say I did not participate in the movements or the shots taken by the avatar. Hence it is certain that my action did modify the state of the game as a whole, and it specifically moved my avatar.

The change in the state of the avatar, however, also brings about new player actions. By crossing enemy creeps, I move my mouse to attack them; if my character's energy is low, I click so that he moves away form the battle. Character and player mutually interchange properties. The pressing of a button makes the characters use magic that wins a combat allowing the player (or would it be the game?) to move on to the next phase. What is established between both is an articulation (Latour, 2001), a negotiation of possibilities, sharing the responsibility of action among all elements involved.

Videogames make use of various ways to guide or limit the player's choices of action, and therefore direct the relation established between player and avatar. Lankoski (2011) suggest three categories of techniques to guide the gameplay: 1) *Character's Goals,* which limit the plausible actions in a game. If players wish to move forward, they must agree to their character's motivations. When it comes to DotA, all characters have the same goal, which is to destroy the enemy Ancient.

> [2] *Possible and impossible actions:* What choices have been made available and what possibilities are left out; how reasonable are the choices—what is easy and what is hard? [3] *Predefined functions of a PC:* These are the procedures that are triggered by an event in a game or by the choices of the player (e.g., pre-designed dialogue, movement style, gestures, and facial expressions) (p. 300).

Such restrictions not only stop or distort the player's operation, but also direct it. The opposite, however, also occurs: the action of the player makes room for other elements of the game to present themselves. The avatar is a sort of heritance left by game designers, one that the player receives and must deal with. There is a big array of possible actions that vary according to each game. These actions and the game's virtual world are built in a way to adjust to each other. The character, its abilities and available equipment are designed as to make it easier to reach goals in a certain way than another. The environment is projected to interact with this character's limitations and abilities with certain inclinations or availabilities. This availability is not present in that world alone, but it resides in the relation established between specific abilities of that character and the way objects from that world encourage or discourage certain possibilities of action (Gee, 2008).

It is easier to understand the relation between the character's restrictions and the player's actions if we exam the way vehicles in racing games, which obviously are not meant to resemble humans, are set apart from one another and how they are presented: in a general sense they do not have a pilot – the vehicles diverse in terms of acceleration, turning skills, top speed and so on. None of them excels in all departments. Maintaining a certain balance in the game is paramount, so much that all come close in terms of general capacity. A common organization is for cars (or aircrafts) with good acceleration not to have top speed, the same way cars with great maximum speed have poor acceleration. These functional differences are by no means trivial, and they significantly affect the way the game unfolds. For instance, narrow lanes filled with turns are significantly harder if the player chooses a car with poor turning skills. The same way a vehicle with good acceleration instead of top speed will benefit the player during races that take place in tracks filled with interconnected turns. In this case the ability to quickly regain speed after slow sections, instead of purely trusting in maximum speed – which in such tracks can never be achieved –, is beneficial.

Action is displaced among the actors throughout the game. The player acts so that the character acts, once both possess active force to move the game forward. It is no longer necessary to look back the two traditional ontological sources of knowledge – subject and object. I find it more interesting to refer to propositions, in the terms suggested by Latour (2001; 2004, 2005b). Propositions are not arguments, nor objects, not even a middle ground between them. They are, above all, performance.

> It is precisely what the word "pro-positions" suggests: they are not positions, things, substances or essences intrinsic to a nature constituted of mute objects in face of a talking human mind. But they are *occasions* to establish contact, made possible by various entities. These occasions allow entities to modify their definitions throughout an event (Latour, 2001, P. 164).

Consequently, what distinguishes player and game is not one single ontological abyss, but innumerous big and small, reductive and non-reductive, temporary and definitive differences. Treating both as propositions makes possible for all entities involved to modify their definitions throughout an even, in this case, a match. The relation established between propositions is not of correspondence, but of articulation. The player articulates the character throughout the game, but the opposite also occurs. Articulation is not the privilege of a human mind surrounded by things of the world, but a property common to propositions, one in which different kinds of entities may take part.

The level of sophistication in combining the chosen vehicle with the specific demands of each track is clearly reached only through iteration. Repetition teaches players the difficulties of a game, motivating them to reflect and be critical when it comes to considering their own style and ability. The "use" of avatars by players thus operates in this same model. Using Goblin many times, for example, teaches players the best places to plant bombs, which items are necessary in the beginning of the match and which become obsolete after some time, and which abilities should be developed first and their level of priority.

Thought / action are therefore based in the articulation of many heterogeneous operations. Various non-biological mechanisms such as technologies take place in this process. Thought is no longer the attribute of a substance that is unique and transparent to itself. We must also leave behind the idea of a free and volunteer subject in the face of a world reduced to inertia and causal mechanisms on behalf of a network of actors that replace the radical oppositions of the traditional ontology with a nuanced, mixed world, where the effects of subjectivity emerge from local and transitory processes. Thinking is a collective state, where men and things mix (Levy, 2004).

Differently from fictional characters, the "psychological motivations" of a videogame character are nearly insignificant when compared to their possibilities of action. There is a popular mistake of assuming players want main characters to have strong personalities, especially in adventure or action games. But if we look at the most popular examples of these genres we quickly realize that the character's personality is often reduced to a minimum. Let's examine Super Mario 64 (Nintendo of America Inc., 1998): although Mario has a very unique appearance, what really is his personality? He actually does not have any, making it blurred enough for players to imprint their own personality on him. What about Lara Croft, from Tomb Raider (Learning Company. et al., 1998)? Once again, distinct appearance, undefined personality. And if we take a look at the space soldier in Doom (Id Software; Activision, 2003) or Gordon Freeman in Half-Life (Valve, 2007) we will not find any personality at all (Newman, 2004).

In the guide I used to pick the Goblins, the character description was as follows:

> Devilishly clever, the goblin techies, despite their small physical presence, are a force to be reckoned with. In line with their goblin brethren, the techies have the skill of laying mines in the earth, invisible to the naked eye. Also, after extensive training with the Orcish voodoo priests of Kalimdor, the Techies are adept at laying paralysis-inducing traps along with their potent explosives. Wary be the foe who takes these three lightly (XSTORM999, 2011).

More than appearance or story, videogame characters are differentiated by their ability to affect the gameplay. They are plain, and might generally be

defined in one sentence; they are generally described by players in terms of abilities they possess or action skills, as can be seen in the description above.

The relation with the avatar is not exhausted in a specular relation – it is actually an inventive one, able to expand the experimentation range of players. Between them, a circulation of reciprocal effects takes place in a zone that produces differences, thus establishing articulation. This articulation is neither an individual nor a social field; neither does it belong to the subject nor to the game, but rather it is a cognitive agency "(...) made of connections, networks, temporary creation of interfaces belonging to both sides of the traditional ontological frontiers." (Levy, 2004, p. 183).

It is not unusual for youngsters playing with super-human heroes to replay a scene because they felt "they had failed their characters". They wish to take part in a more spectacular scene, in resonance with one of a super-hero. Players feel responsible for the character (Gee, 2007).

We indiscriminately mix our desires with things, the collective with narratives. From the moment we follow any hybrid closely, it sometimes seems like a thing, sometimes like a narrative, but it is never reduced to a simple entity (Latour, 2005b).

Players are capable of understanding the character as a project with a predictable trajectory in time, which must correspond to expectations within its own limitations. Players plan the kind of "person" they want their characters to become, the history they will have, the situations they should or should not engage (Gee, 2007). This also comes from all that is learnt from the game, and how the game is supposed to unfold for that player. In order to operate an avatar it is paramount to find a way to adjust the abilities and the limitations of the character to the game's availabilities in terms of space, in a way to adequately reach certain goals. But nevertheless the character retains a certain amount of malleability, and becomes a kind of vessel for the player's intentions and goals.

The character – with its abilities, goals and limitations – is a project the player inherits from designers, so in this sense it is an imposition. However, this very character is a vessel for players' goals and intentions, so long as they take into consideration the inheritance received. In order for both goals to be achieved it is important that players bring their understanding closer to that of the designer, so that they can come up with their own goals – keeping in mind the goals proposed by the game (Gee, 2008).

V. Final Considerations

As discussed above, the role of the player character is not to represent the player, but to outline the set of possible actions within the world of the game – such as opening doors, jumping or running. Treating this translation characters make of players' actions as representation is a negative mediation, because it brings up the idea of unrestricted access to the virtual world. This notion holds the possibility of discarding all intermediary recourses such as keyboard commands or joysticks, whose function would thus be to distort the will of the player.

The relation here is not the connection between two separate entities, but a movement distributed among a group of actors. The avatar is not the player's middleman in the virtual world, whose function is to simply represent the player in that environment. If the avatar's only function was to represent the action or the will of a player, limitations imposed by each kind of avatar should be considered a defect. A glitch in this representation of wills makes the avatar an unreliable middleman. But if we assume that the function of the avatar is mediation (LATOUR, 2005a, 2005b), it no longer represents the player's action, but it translates the action. The avatar no longer transports the player's will, he unfolds it, and by that constantly redefines player and game, distributing its supposed essence among the elements that comprise the action. Unexpected bifurcations unfold new universes of possibility at every action. Technologies are conceived to "as closely as possible relate to cognitive modules, sensorial-motors circuits, portions of human anatomy and other artifacts in multiple agencies of work" (Levy, 2004, p. 181).

Player, avatar and the digital environment propagate activities in a transitory and open network, through articulations or bifurcations. Articulation is precisely this translation between two spaces or two different universes: from the analogical to digital, mechanical to human, hence building a heterogeneous collective through a deforming translation.

What we propose is the existence of interpenetration between cognition and game, in a way we can no longer take them as pure, but as hybrids instead. Technology here is the element capable of reconfiguring human operations. The encounter between subject and videogame makes it possible to reconfigure cognitive functioning, in a kind of symbiosis that articulate goals, options and perspectives. From this encounter someone or something else is born, that is not constrained by any of those two agents; a third being, a hybrid. Cognition and game establish a complex relation, in which both are redesigned through operation.

It is not about denying the diversity of reality. We do not claim that things are nothing but matter, and that for such reason brains can be connected to computers. We also do not claim that things think for themselves. We are not looking for a massive and indistinctive unification in order to claim that the game takes part in the player's thinking. On the contrary, the notion of articulation forces us to recognize the heterogeneity of reality, produced at every step taken. If articulation takes

us to the notion of translation is because nothing follows the same way of functioning, the action must overcome discontinuities that transform it. Action itself is a moving discontinuity whose result is the promotion of other differences. What we suggest is *"an ontology based on facts, purely relational, and therefore are neither material nor spiritual, neither objective nor subjective"* (Levy, 2004, p. 183).

Instead of using the dichotomy subject-object as a starting point, or any of its variations such as individual-medium, nature-society, body-mind as dichotomies that allow knowledge or action to take place, we take them as the result of an action. Practice holds an ontological place in this panorama, specifically because it does not unite two distinct realities, but is responsible for the creation of two emerging poles, resulting from a network of processes, building itself reciprocally. Subject and object emerge, thought action, out of a field comprised of knowledge and things, of material, social, political, technological and linguistic elements. And each of these possesses a distinct operational structure.

We should stop focusing on the rough, specular and easy opposition between flesh and blood men and the metal machine. We should instead focus on hybrid functionings made of men, words, networks and computers. The effectiveness of actions in the virtual world depend on this very interconnection, on the alliance between biological beings and an ever-growing number of artifacts and protocols, crossings of collective hybrids and complex and ever-changing circuits.

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The board members can also join us as Individual Fellow with 40% discount on total fees applicable to Individual Fellow. They will be entitled to avail all the benefits as declared. Please visit Individual Fellow-sub menu of GlobalJournals.org to have more relevant details.

We shall provide you intimation regarding launching of e-version of journal of your stream time to time. This may be utilized in your library for the enrichment of knowledge of your students as well as it can also be helpful for the concerned faculty members.

After nomination of your institution as "Institutional Fellow" and constantly functioning successfully for one year, we can consider giving recognition to your institute to function as Regional/Zonal office on our behalf.
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- The Fellow can organize symposium/seminar/conference on behalf of Global Journals Incorporation (USA) and he/she can also attend the same organized by other institutes on behalf of Global Journals.
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Note :

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- In future, if the board feels the necessity to change any board member, the same can be done with the consent of the chairperson along with anyone board member without our approval.
- In case, the chairperson needs to be replaced then consent of 2/3rd board members are required and they are also required to jointly pass the resolution copy of which should be sent to us. In such case, it will be compulsory to obtain our approval before replacement.
- In case of "Difference of Opinion [if any]" among the Board members, our decision will be final and binding to everyone.

"

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1. General,

2. Ethical Guidelines,

3. Submission of Manuscripts,

4. Manuscript's Category,

5. Structure and Format of Manuscript,

6. After Acceptance.

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The recommended size of original research paper is less than seven thousand words, review papers fewer than seven thousands words also.Preparation of research paper or how to write research paper, are major hurdle, while writing manuscript. The research articles and research letters should be fewer than three thousand words, the structure original research paper; sometime review paper should be as follows:

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References

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22. Never start in last minute: Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

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27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. Think technically: Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

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33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

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Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
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- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

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Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page
- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.

Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

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	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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