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Software and Data Engineering

DISCOVERING THOUGHTS AND INVENTING FUTURE

HIGHLIGHTS

- Automated Software Testing
- Efficient Algorithm to Determine
- Agile Software Development
- Virtual Construction Simulator

Datacentre

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Efficient Algorithm to Determine Whether a given Graph is Hamiltonian or not with all Possible Paths

By Narendra Pratap Singh, Ramu Agrawal & Indra Paliwal
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Abstract - Given a Graph G (V, E), We Consider the problem of deciding whether G is Hamiltonian, that is- whether or Not there is a simple cycle in E spanning all vertices in V. [1] However to Verify that the given cycle is Hamiltonian by checking whether it is permutation of the vertices of V and whether each of the consecutives edges along the cycle actually exists in the Graph. This Verification Algorithm can certainly be implemented to run in O (n2) time, where n is the length of the encoding of G [2]. But to predict in Advance that the Graph has Hamiltonian Cycle or not was still Exponential before this Algorithm. This Problem is known to be NP-Complete hence cannot be solved in Polynomial time in |V| unless P=NP. However till today there was no known Criterion we can apply to determine the existence Hamiltonian Circuit in General [3]. For its Exponential time We can Refer to theorems: - Vertex Cover problem is polynomially transformable to the Hamiltonian circuit Problem for Directed graphs, hence the Hamiltonian Circuit problem for Directed Graph is NP-Complete and the Hamiltonian Circuit Problem for Directed Graph is Polynomialy transformable to Hamiltonian Cycle Problem for Undirected Graph, hence the Hamiltonian Cycle Problem for undirected Graph is NP-complete [4]. Note that these derivations are based on the CNF- Satisfiability.

Through this Paper we have introduced a Newer Algorithm with different approach to determine whether a given Graph is Hamiltonian or Not with all possible Paths, by applying Few Mathematical and logical Operations. This provides necessary and sufficient condition for a graph to be Hamiltonian.

Keywords : *Adjacency matrix, Adjacency List, Nodes, Vertices, Edges, Hamiltonian circuit.*

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Narendra Pratap Singh [α], Ramu Agrawal [σ] & Indra Paliwal [ρ]

Abstract - Given a Graph *G (V, E),* We Consider the problem of deciding whether *G* is Hamiltonian, that is- whether or Not there is a simple cycle in *E* spanning all vertices in *V.* [1] However to Verify that the given cycle is Hamiltonian by checking whether it is permutation of the vertices of *V* and whether each of the consecutives edges along the cycle actually exists in the Graph. This *Verification Algorithm* can certainly be implemented to run in $O(n^2)$ time, where *n* is the length of the encoding of *G* [2]. But to predict in Advance that the Graph has Hamiltonian Cycle or not was still Exponential before this Algorithm. This Problem is known to be NP-Complete hence cannot be solved in Polynomial time in |V| unless P=NP. However till today there was no known Criterion we can apply to determine the existence Hamiltonian Circuit in General [3]. For its Exponential time We can Refer to theorems: - Vertex Cover problem is polynomially transformable to the Hamiltonian circuit Problem for Directed graphs, hence the Hamiltonian Circuit problem for Directed Graph is NP-Complete and the Hamiltonian Circuit Problem for Directed Graph is Polynomialy transformable to Hamiltonian Cycle Problem for Undirected Graph, hence the Hamiltonian Cycle Problem for undirected Graph is NP-complete [4]. Note that these derivations are based on the CNF- Satisfiability.

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I. Introduction

Hamiltonian Problem is Decision Problem in which *G (V, E)* should be traversed from any one vertex to same vertex without repeating any vertex again (means, Vertex should be traverse exactly once). We look for *n* long sequence of vertices $v_0, v_1, v_2, \ldots\ldots, v_{n-1}$ visit all vertices in *v* such that $0 \le i \le n$, *(vi, v(i+1)mod n)*$\in E$, along with the element of Adjacency Matrix *Ai, j= 1,if* $\forall E \in (i, j)$, *0,* otherwise. From the general prediction as prescribed in literature that Hamiltonian Cycle exists if and only if there is an *n*- long tour that cover all the vertices and returns to the standing point.

Scientist around the globe deduced the Method based on the number of edges and degrees of graph, some for planarity and some for connected but they all failed for a general graph and was not sufficient. It follows the CNF- satisfiability also [4].

But we put through the above statement from the mathematical and logical point of view.

By this algorithm, now the scientist will have reasonable condition to determine the Hamiltonian Circuit in Advance without traversing it vertex to vertex manually on the paper.

Till today this problem which spurred the computer scientist around the globe to be able to draw an Algorithm which Culminate the possibilities, the usage of global information was shown to speed up the process: however it has cost in communication and complexity of individual agent. Now in our Algorithm there is no foundation for an undirected, directed, planarity, colorability, and connectedness of a graph, it can be applied to the all types of graphs.

Rest of the paper is organized as follows. Section2 present the related work. The proposed method algorithm has been described in section3. In section4, experimental results and sample run have been presented and paper is concluded in section5.

II. Related Work

Since, its (Hamiltonian Cycle Problem) origin, by famous Irish Mathematician Sir William Rowan Hamilton, 1859, was still unsolved. There was no known criterion we could apply to determine the existence of Hamiltonian circuit in general. A circuit is a connected graph *G* is said to be Hamiltonian if it includes every vertex of *G.* Hence a Hamiltonian Circuit in a Graph of *n* vertices cost of exactly *n* edges. Obviously, not every connected Graph has Hamiltonian Circuit. For example, neither of the Graph shown in figures (2.1 and 2.2) and has a Hamiltonian circuit. This raise the Question: What is the necessary and sufficient condition for a connected Graph G to have Hamiltonian Circuit? [5]

Also, No known Characterization to determine Hamiltonian graph in any given Graph G has been found [6].

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However several Scientist has proposed several methods on the basis of degree and edges with the reference to any specific graph (like connected, planarity, etc.). But they had not found full success with necessary condition to predict Hamiltonian cycle in advance for every Graph. Most of works has been presented before the 1975. Hence there was no programming based algorithmic approach had been considered? Some famous works are as follows:

- Every Graph G with $n \geq 3$ vertices and minimum degree at least *n|2* has a Hamiltonian Cycle [7] (Dirac 1956).

[Note that this theorem bound prediction within limit of $n \geq 3$.]

- Every Graph G with $|G| \geq 3$ and $K(G) \geq \alpha(G)$ has a Hamiltonian Cycle.

[Note that the theorem is bounded within condition $|G| \geq 3$[7](Dirac 1956).

- Every 4- Connected planar Graph has a Hamiltonian Cycle. (Tutte 1956)[8, 9, 10]
- Historically, Dirac's Theorem formed the point of departure for the discovery of a series of weaker degree conditions, all sufficient for Hamiltonian circuit. The development of our algorithm culminates all the theorem s and encompasses all the earlier results.

If G is graph with n vertices and degrees $d_1 < d_2 < \ldots\ldots < d_n$, then the n-tuples $(d_1, d_2, \ldots, d_n)$ is called the degree of sequence of G. Note that this Sequence is unique, even though G has a several vertex enumeration giving emphasis to its degree sequence $(a_1, a_2, \ldots\ldots, a_n)$ Hamiltonian if Every Graph with *n* vertices and a degree sequence point wise greater than $(a_1, \ldots . a_n)$ *if* $(d_i \geq a_i$ *for all i)*

The following theorem characterizes all Hamiltonian Sequences.

- (Chvatal 1972), An integer Sequence $(a_1, \ldots, a_n)$ such that $0 \leq a_1 \leq \ldots\ldots \leq a_n < n$ and $n \geq 3$ is Hamiltonian if and only if the following holds for every $i < n/2$:

$$a_i \leq i \Rightarrow a_{n-1} \geq n\text{-}i.$$ [11]

- An integer sequence (a1, …an) such that $n \geq 2$ and $0 \leq a1 \leq \ldots\ldots \leq an < n$ is path Hamiltonian if and only if every $i \leq n/2$ is such that $a_i < i \Rightarrow a_{n+i-2} \geq n\text{-}1$ Hamiltonian Cycle in the square of a graph
- (Fleischner 1974), if *G* is a 2- Connected graph then G^2 has a Hamiltonian Graph. [11]
- (Seymour 1974), let *G* be a Graph of order $n \geq 3$, and k be positive integer. If *G* has a minimum degree $\delta(G) \geq (k/k+1)*(n)$, there *G* has Hamiltonian Cycle *H* such that $H^k \subseteq G$. [12].

For $k=1$, this is preciselyDirac's theorem the case $k=2$ had already been conjecture by Posa in 1963 and was proved for large n by kamlos, Sarojy & Szemerdi, 1996.[13]

Beyond the above given thesis, the age comes to programming and computer scientist developed several algorithms in the same context but did not get succeed to make sure exact prediction for a graph to be Hamiltonian or not. These are given as follows:

- Frieze [14] introduced a heuristic polynomial – time algorithm, Ham, for finding Hamiltonian cycle in random graphs with high Probability.

[Note that High probability terms indicate not to be fully assured for being a Graph, Hamiltonian.

- Improved version of Ham, Semi Ham [15] by keydar.
- Vandegrind analyzes the knight's tour problem in some details. He gave several existence and Non-existence theorems for different parameters values. He also reports on existence compute Experiments.
- An inspired Heuristic for regonizing Hamiltoion graphs, by Israel A. Wagner.

From IBM Hafia research lab, Matan, Hafia, Dept. of C.S. Technion City, Haifa 32000, Israel and Alfred M. Bruckstein from AT &T Bells at Murray Hill NJ0794, USA. Remain some challenging Question.

1. Vertex ant walk (VAW) has the Hamiltonian cycles as its limit cycle; however we do know if those are the only limit cycles of the process which are longer than the n variables.
2. A probabilistic Version of VAW rule does not determine the next neighbor specifically, but assigns each neighbor a probability according to its current (μ, t) mark (e.g) the probability of jumping from u to v be

$$Prob(u \rightarrow v) = (1/(1+\mu(v)))/(\sum_{w \in N(u)}(1/(1+\mu(w))$$

Where, clearly, $\sum_{w \in N(u)} prob\ (u \rightarrow w) = 1$ *N(u)* stands for the sets of vertices $v \in V$ such that $(u, v) \in \sum$). In such a semi-Random process faster, (In recognizing a Hamiltonian Graph), on the average, or lower than the deterministic one?

[Note that, the prediction in above method is probabilistic, means of having some amount of Uncertainty.]

- Solving the Hamiltonian cycle Problem using symbolic determinant by V.Ejov[1], J.A.Filar[2], S.K Lucas[3]& J.L. Nelson[4](1, 2,3 school of mathematics and srtatistics, University of south Australia, Dept. of mathematics, Harvey mudd college ,1250 N. Dartmouth Ave Clare mount CA91711 USA. has applied Algebra but Complexity remain for this algorithm is Exponential.
- *Bitonic Euclidean traveling-salesman problem*[2]

The *Euclidean traveling-salesman problem* is the problem of determining the shortest closed

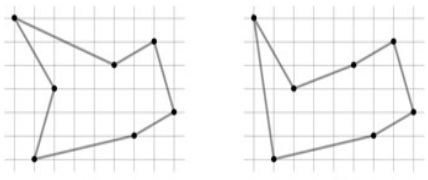
Tour that connects a given set of *n* points in the plane Figure 2.1(a) shows the solution to a 7- point problem. The general problem is NP-complete, and its solution is therefore believed to require more than polynomial time

Figure 15.9: Seven points in the plane, shown on a unit grid. *(a)* The shortest closed tour, with Length approximately 24.89. This tour is not bitonic. *(b)* The shortest bitonic tour for the same set of points. Its length is approximately 25.58.

J. L. Bentley has suggested that we simplify the problem by restricting our attention to *bitonic tours*, that is, tours that start at the leftmost point, go strictly left to right to the rightmost point, and then go strictly right to left back to the starting point. Figure (b) shows the shortest bitonic tour of the same 7 points. In this case, a polynomial-time algorithm is possible.

Describe an $O(n^2)$-time algorithm for determining an optimal bitonic tour. You may assume

That no. two points have the same *x*-coordinate. (*Hint:* Scan left to right, maintaining optimal Possibilities for the two parts of the tour.)



(a) (b)

But, we have introduced a Newer Algorithm which over comes all the Hurdles suggested in above given recent research, by applying logical and mathematical operations. Hence it proves itself as a sufficient condition for a Graph to be Hamiltonian.

III. The Proposed Method

In this section, we will present our original approach to determine all Hamiltonian paths for a Given Graph G. G(V, E) is the ordered pair consists two sets, V for vertices(v1, v2, v3, …., vn) and E for edges (e1, e2, e3, …., en)[or ek∈E, k∈ N . the vertices are the basic nodes types which stores the information of Graph, itself a mathematical structures and finds its application in many areas of interest in which problem need to solved using Computers. In case of Hamiltonian, e.g., Indian Railways may need to expand its tracking belongs to each station in such a manner that the train running on this must visit each station exactly once by starting from any station and reached at the same. It represented in the Data Structures. These representations commonly used Adjacency Matrix, Adjacency list and Multi- list representation. Firstly, we will use these for Adjacency Matrix $A_{ij} = 1$, if $\forall e \in (vi \Leftrightarrow v_j)$, $A_{ij} = 0$, otherwise, takes $O(n^2)$ space to represent graph with n vertices, even for Sparse Graph.

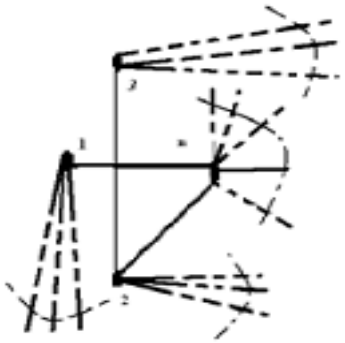
Algorithm *(for First Basic method*)*:

1. Draw the Adjacency matrix (Inputting graph):

Let take adjacency matrix for any undirected graph without parallel edges or loops.

	[1]	[2]	[3]……	[n]
[1]	0	0	1 ……	0
[2]	0	0	1 ……	1
[3]	1	1	0 ……	0
.	.	.	. ……	
.	.	.	. ……	
.	.	.	. ……	
[n]	1	1	0 ……	0

Fig. 3.1 : n*n- matrix for undirected graph

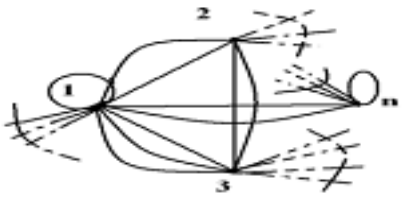


Certainly, it would represent a Graph, connected, planar, directed, and undirected or of having some self loops and parallel edges to put p∈W, (p, no. of edges)

Adjacency matrix for directed/undirected having loops and parallel edges.

	[1]	[2]	[3]	……..[n]
[1]	1	2	3	…….. 2
[2]	2	0	2	…….. 0
[3]	3	2	0	…….. 0
.	.	.	.	……
.	.	.	.	……
[n]	.	.	.	……. 1

Fig. 3.2 : n*n matrix for graph having loop and parallel edges



2. Make function for traversing from vertex to vertex:

For a completely connected graph there will be *n!* Path (possible arrangements of all the vertices), which provides highest probability to find out the Hamiltonian paths, hence for the cases having parallel edges the path increases by the factor of *2*. Let take any

graph, fig (3.1), if we make all possible arrangements of vertices as paths.

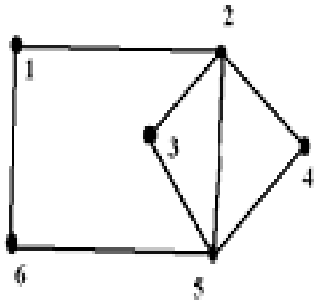


Fig. 3.3 : Undirected graph for without Hamiltonian

1-2-3-4-5-6-1
1-2-3-4-6-5-1
1-2-3-5-4-6-1
1-2-3-5-6-4-1
.
.
.
.
Up to *6!* (Possible constructions)

However the path of the fashion of that arrangement may not be occurred, but our main concern is to make them.

	1	2	3	4
1	0	1	0	0
2	1	0	1	1
3	0	1	0	0
4	0	1	0	0
5	0	1	1	1
6	1	0	0	0

Observe carefully, in the case of Hamiltonian the possibility to move on from one vertex[i] to another vertex [j] occurs only when if the $[i][j]_{th}$ element of matrix is 1(one). If the value of [i][j]th element in adjacency matrix is 0(zero) then it halt the path to proceed.

In the Succeeding way if all the values in the given path is 1 in the reference of [i][j]th element therefore it has Hamiltonian path because in the path (say) 1-24-5-3-6-1, all the element of matrix([1][2], [2][4], [4][5], [5][3], [6][1] are 1(one), except [3][6]. If this value becomes one the path will be successfully turn into Hamiltonian circuit.

Let us take a Hamiltonian Graph

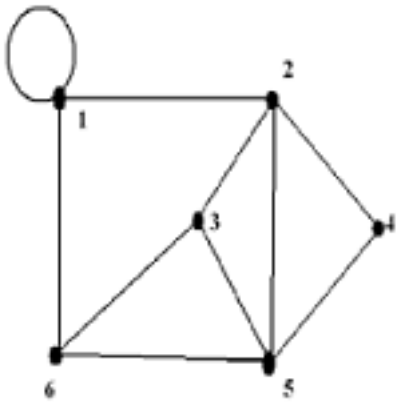


Fig. 3.4 : Undirected graph with parallel edges and loops

Adjacency matrix for fig (3.4)

	1	2	3	4	5	6
1	1	1	0	0	0	2
2	1	0	1	1	1	0
3	0	1	0	0	1	1
4	0	1	0	0	1	0
5	0	1	1	1	0	1
6	2	0	1	0	1	0

We observe carefully for path (say) 1-2-4-5-3-6-1, all the element of adjacency matrix [1][2], [2][4], [4][5], [3][6], [5][3], [6][1] have some value *k, k*$\in W$,whole numbers.

A. We enumerate a logic from this, let take the array elements in the specific sequences (generated by permutation, all possible paths, drawn by *interchanging array function*).that to put *logical AND (&&)* between these elements. Interchange them for above given sequences.

If P_k = *[1][2]&&[2][4]&&[4][5]&&[4][5]&&[5][3]&&[3][6]&&[6][1] = 1*

There, Hamiltonian circuit exists.

Else

Not exist.

Functionally in C programming, we have done this as:

```
Visit (int*, int, int)
Visit (int*NODES, int N, int k)
{
Static level= -1;
Level =level+1;
NODES[k] =level;
If (level == N)
{
 Int j=0, p=1, lock=0;
 While (j<N-1)
P = GRAPHIN [NODES[j]}[NODES[j+1]&&P;
J++
}
P=GRAPHIN [NODES][j] NODES[j+1]}&&P;
```

Do the same operation for all the sequences, we get P_1, P_2, P_3,…,, P_n.

B. Then we apply logical OR(||) operator between all the path values.

$P = P_1//P_2//P_3//\ldots..,\ //P_n$

If P = 1

Then it is Hamiltonian Graph

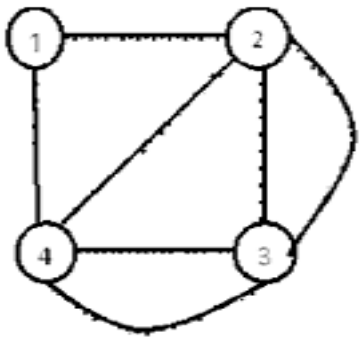
Else

Not Print the Paths:

In this program it gets prints by the function

Input Adjacency Matrix:

	1	2	3	4
1	0	1	0	1
2	1	0	2	1
3	0	2	0	2
4	1	1	2	0



*fortunately this algorithm provides sufficient conditions for a Graph to be Hamiltonian and also print all the possible paths but Unfortunately takes more time for large Graphs, so we were in search for next Algorithms which take less time than this, therefore we developed second Algorithm which facilitate all the requirements.

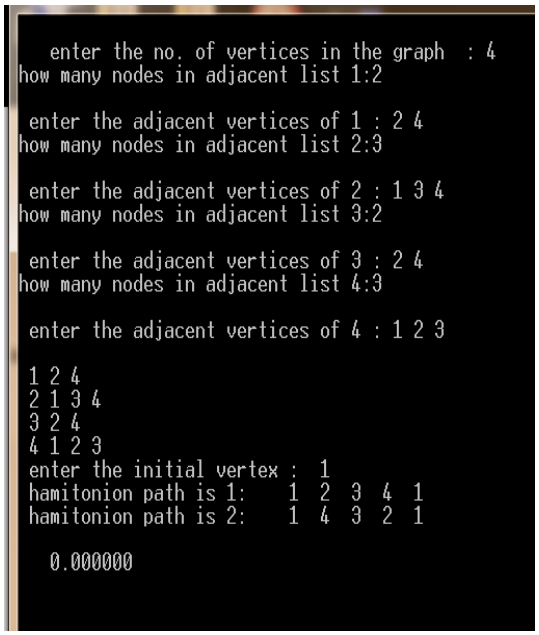
We prepare second Algorithm using the concept of Graph theory, means of having linked list, structures and few pointers.

Second Algorithm:

Pseudo code for second Algorithm:

```
Algorithm Hamiltonian path (vertex adj[ ], N, K, a[ ])
{
Create_ham(adj, p → vertex, N)
Print_ham(a, N)
Count: = 0;
If count= N then
{
p: = adj[K]; p:= next;
While p≠ NULL do
   {
      If a[1] = p →vertex than write (a, N); break;
   }
   P: = p →next;
}
Else
{
   P: =adj[K]; p: =p →next;
   While p ≠NULL
    {
         Loc: =0;
         For j ←1 to count do
         {
              If a[j]=p →vertex then
              {
                   Loc++; break;
               }
         }
         If loc=0 then
       {
          Count++;
a[count]:=p →vertex;
create_ham(adj, N, p →vertex)
              count--; a[count]:=0;
        }
        P: = p →next;
  }
 Print_ham(a,N)
 {
      For i ←1 to N do
       Write(a[i]);
Write(a[1]);
}
}
```

Output



IV. Experiment Result

Let an Example of the Wide Network of Airlines, in which there are *n* Airports, as in the given figure you may assume each node as an Airport and the edges as the route of Airline from one to another.

Hence this will form a type of Adjacency list (linked list), in which each airport has the knowledge of incoming and outgoing flights in various directions. In the given figure ( ), we take *Home Node* A (means, the Plane should have to back this again after traversing all the airports exactly once). You may consider any one airport as a Home Node, in our Algorithm.

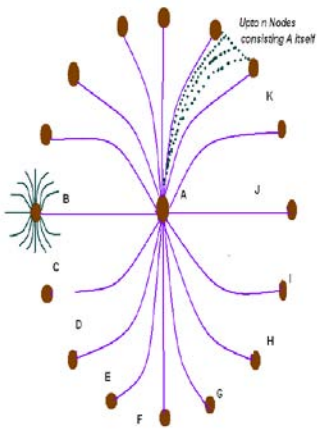


Figure : Graph showing Airlines connections

In the general analysis, take this example of Airline system as a Strongly Connected Complete Graph, means each and every Airport is connected to all other Airports.

T (*n*) for Best Case:

Let start from the node A, the Adjacency list will seem like this

$$A \rightarrow B \rightarrow C \rightarrow D.....$$
$$B \rightarrow A \rightarrow C \rightarrow D.....$$
$$C \rightarrow A \rightarrow B \rightarrow D.....$$
$$.....$$
$$.....$$

If all nodes are reachable from A, than flights may seek to any Airport, Note that this step will make just one comparison and proceed to next one (say, B).

On the next point, it will decide to move on the next Airport Except the later traversed Airport (A). If this node is reachable to another then it will move on by making just single Comparison again. This sequence of comparison at one time and moving on the next node will remain next Node will remain continue till it did not reach at the initial vertex (Airport).

$$T(n) = 1+1+1+.....+1 \quad (n \text{ times})$$

$$T(n) = n$$

T (*n*) For Worst Case:

In the worst case, the Airplane will choose the move to specific Airport by making (n-1) comparison for itself; therefore the airplane at the next step will decide the next move to further proceeding after making n-1 comparison. The routine will remain till the Airplane did not reach at the initial Airport (or Standing point).

$$= n\,(n-1)!$$

Hence, this Algorithm runs near to polynomial for small vertices sets.

V. Conclusion

Our method exploits the ways to find Hamiltonian Circuit using Sequential and predicate logic and opens up opportunities for future researcher interested in this problem succinctly in much advance way. However our method has successfully find out all possible paths but still working near to polynomial not exactly polynomial, but it opens opportunities to think about this problem by applying advance methods of predicate calculus to find out all possible paths in polynomial time.

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Agile Software Development: A Case Study of Web Application

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Abstract - Agile methodology is an approach used for the development of a project which helps to respond to the unpredictability of building software through incremental, iterative work cadences. These methodologies are used to deal with the situations where the waterfall model fails. The biggest drawback of waterfall model is that it assumes that every requirement of the project can be identified before any design or coding occurs [1]. In this paper we are specifying the differences in the development of a project by using the Agile Methods: Extreme Programming (XP) and Scrum through a case study on Women's Era (WE- A State Level Women Development and Support).

Keywords : *Agile Methodology, Extreme Programming (XP), MVC –Design Pattern, Sprin t, Backlogs, Stories.*

GJCST-C Classification : *H.3.5*

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Mr. D. T. T. Vijaya Kumar [α] & Ms. M. Sowmyavani [α]

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I. Introduction

Agile methods software development (also called *Agile Modeling* denoted *AG* for short) reduces the software lifecycle time by developing a prototype version, then integrating functionality on an iterative basis responding to customer requirements and testing throughout the development cycle. Agile methods originate from the instability of the technical environment and the fact that the client is often unable to define every single requirement at the start of the project. The term "agile" is a reference to the ability to adapt to contextual changes and changes to specifications which occur during the development process.

II. Agile Methodology

Agile software development refers to a group of software development methodologies that promote the development of iterations, open collaborations, and process adaptability throughout the life-cycle of the project. It chooses to do things in small increments, with minimal planning, rather than plan at length. This helps to minimize the overall risk, and allows the project to adapt changes more quickly. There is also an emphasis on stakeholder involvement [2].

Any agile software process is characterized in a manner that addresses three key assumptions about the majority of software projects:

1. It is difficult to predict in advance which software requirements will persist and which will change. It is equally difficult to predict how customer priorities will change as a project proceeds.
2. For many types of software, design and construction are interleaved.
3. Analysis, design, construction, and testing are not as predictable as we might like.

An agile process, therefore, must be adaptable. [3]

In this case study we are involving women from different categories of society from different areas of Andhra Pradesh. They specified a bulk of requirements which they are in need regularly like Legal issues, Medical issues, Educational issues, Recipes and Government schemes. For identifying the sources to get the information they need to spend a lot of time away from home. So, we searched a number of web Applications which will be providing the information related to these requirements but no application is there to serve for all the needs. For this purpose we are going to develop the proposed application to satisfy all these requirements.

After the collaborative communication with the customer we have collected the following things.

They need

- To know the Legal Matters related to Women.
- Different University Notification in a single point access.
- Expert lectures and study material
- To have the information related to the precautions and preventions of various diseases and likes to have suggestions from the Medical practitioners.
- To know the information related to local, national and international recipes.
- Government Schemes related to women.

a) Legal issues

We had collected the information related to legal matters from Lawyers, Police department and different social organizations.

b) Educational issues

Gathering the notifications and proceedings information from different university websites regularly and updating the related data in our application. Collecting the study materials and expert lectures related to different domains.

c) Medical issues

By having communication with Medical Practitioners we are going to collect the area wise information related to various diseases, their precautions and prevention measures.

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d) Recipes

Collecting the information related to different recipes from websites and expert chefs.

e) Government Schemes

Here the source of information is from www.aponline.gov and related government sites.

III. Analysis

At first we are going to consider the development of this case study by using XP.

In this phase we are concentrating on the requirements of users called stories, consists of the features and functionalities and these will be placed on index cards. Customers specify the values for these requirements called Priorities. Depending on the priorities specified by the customers releases will be done. For this case study the priorities specified by the customer are represented by the figure-1.

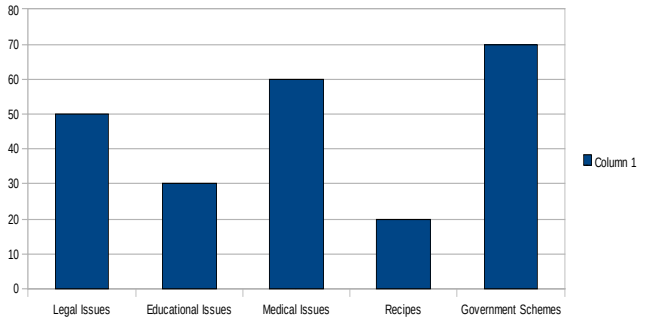

Figure 1 : Customer interest chart

No story should take more than three weeks for the development. If it takes it should be splitted into small stories. The cost and time scheduling must be done again for these. New story can be written at any time. Grouping of the stories will be done for the releases. The releases for this case study are represented by the figure-2, which is totally depending on the priorities specified by the customer.

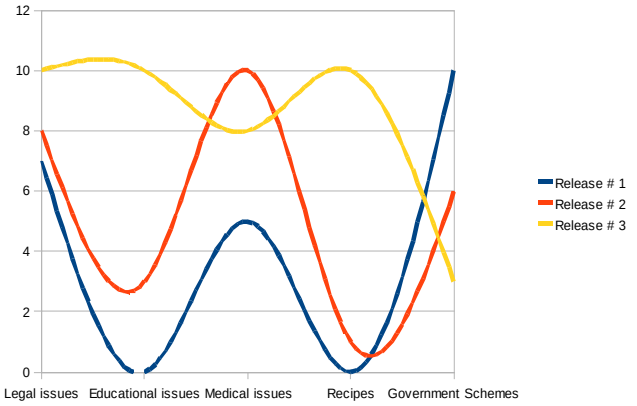

Figure 2 : Priority Chart

IV. Design

XP follows KIS (Keep It Simple) principle. CRC (Class-Responsibility- Collaborator) cards identify and organize the object oriented classes that are relevant to the current software increment. Design occurs both before and after coding commences. Refactoring means that design occurs continuously as the system is constructed.

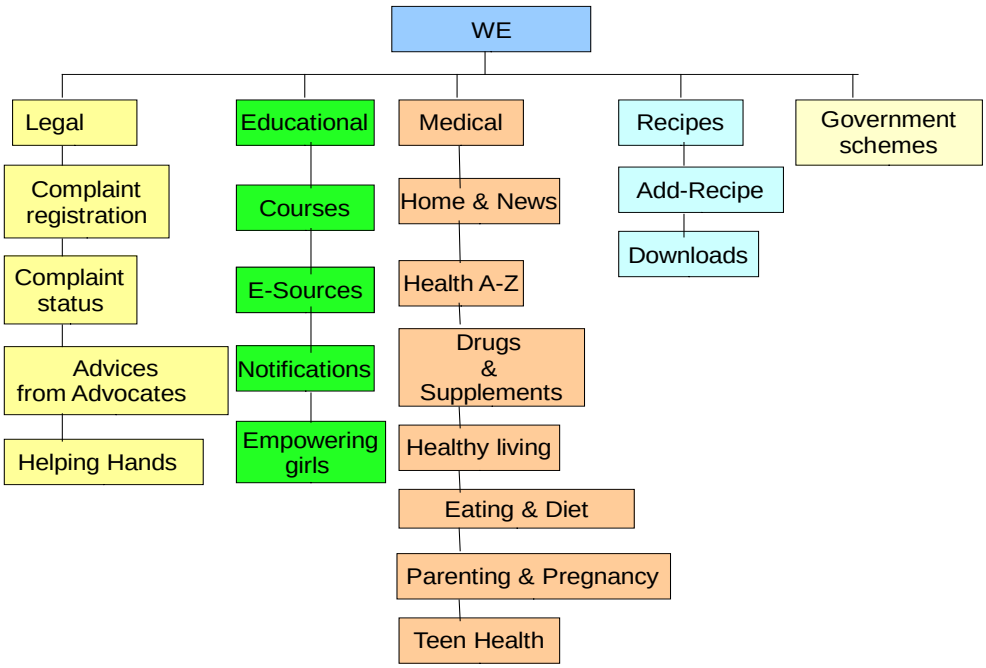

Figure 3 : System Architecture

a) CRC cards

As per the system Architecture the following are the classes

- In Legal issues Complaint registration, Complaint status, Advices from Advocates and Helping Hands. The classes Complaint registration, Complaint status have the internal relationships.
- In Educational Issues courses, E-Sources, Notifications and Empowering girls are the individual functionalities no interdependency between the classes.
- In Medical issues Home & Health, Health A-Z, Drugs & Supplements ,Healthy living, Eating & Diet, Parenting & Pregnancy and Teen Health no interoperability between the functionality.
- In Recipes there are two functionalities Add Recipes and Download.
- In Government schemes we are going to post the information related to government schemes.

As this is the web application this can be viewed by number of user, according to their feedback the developers has to modify. If we follow the traditional processes it may disturb the flow of the system.

b) MVC Design pattern

The model view controller (MVC) design pattern which can weaken the coupling among the different application tiers and make the development and maintenance simpler.The MVC is a fundamental design pattern for the separation between user interface logic and business logic. Since applications are very large in size these days and the MVC design pattern can weak the coupling among the different application tiers of application [2].

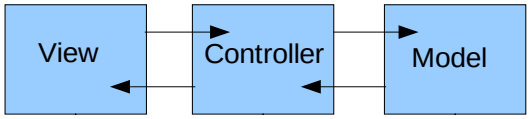

Figure 4 : MVC Model

One way to separate concerns in a software application is to use Model-View-Controller (MVC) architecture.

- The *Model* represents the business or database code
- The *View* represents the page design code
- The *Controller* represents the navigational code [2].

V. Testing

Test case	Testing of Registration form		**Date:** 10/09/2012	
Tester Name	Joy			
Test Designer	Mr. Test			
Functionality	Legal Issues		**Project :** WE	
Module	Complaint Registration			
Test case ID	**Test case Description**	**Expected Value**	**Actual Value**	**Result**
LEG/001	The "complainant Name" is filled in the registration form.	M. Vani	M. Vani	Pass
LEG/002	In address field "pin code" ,string length 6 characters	517102	517102	Pass
LEG/003	Name of the victim	Ravi	Sunil	Fail

Table 1 : Test cases

VI. Acceptance Testing

Acceptance Testing is performed after System Testing and before making the system available for actual use

- *Internal Acceptance Testing* (Also known as Alpha Testing) is performed by members of the organization that developed the software but who are not directly involved in the project (Development or Testing).Here we are involving the analyst and designer.
- *External Acceptance Testing* is performed by people who are not employees of the organization that developed the software.
  - o *Customer Acceptance Testing* is performed by the customers of the organization that developed the software. They are the ones who asked the organization to develop the software for them. This is the project for social benefit so no specific customer is there here we are involving the Doctors, Lawyers and members of social organizations who shared their knowledge to start the process. [This is in the case of the software not being owned by the organization that developed it.]
  - o *User Acceptance Testing* (Also known as Beta Testing) is performed by the end users of the software. They can be the customers themselves or the customers' customers. To perform this task we

selected 50 members of women from different categories of the society.

Depending on the priority chart [Figure 2] releases will be done. After **Release #1** the team computes project velocity in turn used to estimate delivery dates and schedule for subsequent releases and determine whether an over-commitment exists or not.

VII. Scrum

[6] SCRUM incorporates the following framework activities.

- Requirements
- Analysis
- Design
- Evolution and Delivery

Each framework activity will have work task occur within a process pattern called a sprint, is defined and often modify in real time by the scrum team. Scrum emphasizes the use of set of software process pattern that were proven effective for project with tight timely ness changing requirements and business criticality.

In Scrum, the entire framework activities categorized into three phases:

- Pregame
- Game
- Postgame

Pregame consist of two important activities

1. Planning: Definition of a new release based on currently known backlog, along with an estimate of its schedule and cost. If a new system is being developed, this phase consists of both conceptualization and analysis. If an existing system is being enhanced, this phase consists of limited analysis.

Backlog -A prioritized list of project requirements or features that provide business values for the customer. The product manager assesses the backlogs and updates priorities as required.

In this case study the prioritized list is common for XP and Scrum. The requirements already specified above for XP.

2. Architecture: The architecture of scrum deals with the development of design which specifies the process patterns of work units called sprints.

Sprints – consist of work unit that are required to achieve a requirement defined in the backlog that must be fit in to a predefined time-box (Typically 30 days).During the sprint, the work units addresses are frozen and allotted to team members to work in stable environment.

Requirement	Work units
Legal Issues	Complaint registration, Complaint status, Advises from Advocates and helping hands
Educational issues	Courses, E-Sources, Notifications and Empowering girls
Medical issues	Home & Health, Health A-Z, Drugs & Supplements ,Healthy living, Eating & Diet, Parenting & Pregnancy and Teen Health
Recipes	Add Recipes and Download
Government Schemes	General schemes, women welfare schemes

Table 2 : Work units specification

a) Game

Game phase includes in the development activities.

Development Sprints: Development of new release functionality, with constant respect to the variables of time, requirements, quality, cost, and competition. Interaction with these variables defines the end of this phase. There are multiple, iterative development sprints, or cycles, that are used to evolve the system.

b) Postgame

Closure: Preparation for release, including final documentation, pre-release staged testing, and release.

Scrum meetings - are short (typically 15 minutes). Meetings held daily by the scrum teams. Three questions are asked and answer by the all team members.

- What did you do since the last team meeting?
- What obstacles are you encountering?
- What do you plan to accomplish by the next team meeting?

These daily meetings help the team to uncover potential problems as early as possible and lead to knowledge socialization and there by promote a self-organizing team structure.

Depending on the work unit size the designing of the sprint is done and what are the test case studies to be invoked is going to be identified.

Demos – deliver the software increment to the customer so that functionality that has been implemented can be demonstrated and evaluated by the customer. It is not compulsory that all functionalities must be covered but they must be delivered within the time box.

Scrum process patterns enable a software development team to work successfully in a world where the elimination of uncertainty is impossible.

VIII. Conclusion

In agile development process by using XP methodology, the stories can be divided in two number of small depending on the time factor (if a story exceeds

3 weeks for the development that can be divided in to small stories). So in XP the changes can be allowed in the middle of the development. For example, in this case study if we consider the legal issues, adding of another new requirement related to complaint like cybercrime will cause some change in the development which is going to have effect on the size of the story which already have been specified. These types of changes can be acceptable in XP.

In Scrum once the sprints are identified and allotted to the team members they must be stable because they are frozen. No modifications are allowed until the completion of the development of that sprint. Adding of new sprints in the middle of the development is not possible. In XP team size should not exceed10 members, and it is limited to 7 in scrum. XP will not support the distributed development, scrum will support.

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Virtual Construction Simulator

By Dr. Ankur Gupta & Surbhi Setia
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Abstract - In the construction sector, computer simulation has been extensively incorporated to support complex decisions including automation of several different processes and also to design the novel machines or buildings. The changes inhabited in the work zone configurations are reflected in the animations as the work progresses. This also provides an opportunity to the construction workers, as well as agency personnel and general public to visually present the complicated information.

This projected work presents an overview of how simulation modeling can help in learning effective decision making while performing construction activities. The Virtual Construction Simulator provides a user interaction gadget through which user can feed in the inputs that addresses the system to implement those sequences of tasks. The tasks that do not violate certain specified constraints operate concurrently and the operation of these tasks can be viewed on the virtual construction environment as well as the intermediate status of all the elements is updated at the backend.

A comparative analysis of various available alternatives can be done, so as to determine the most optimal and most efficient sequence of operations that can be implemented. Here in the cost of translocation of the various vehicles is taken into consideration for efficiency deterministic. Some predefined constraints are accustomed to the system like the limit on the number of vehicles that can be used, also the parameters involved in evaluation of the efficiency of a plan is subject to some assumptions, they are an approximate to the real world attributes but they are subject to change and can be updated on demand as per the requirements of the system.

GJCST-C Classification : *I.6.0*

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I. Literature Survey

Construction simulation is the science of developing and experimenting with computer-based representations of construction systems to understand and later on predict their underlying behavior. This field of operations and research applications in construction management has experienced tremendous academic growth over the past two and a half decades. The projected work provides an overview of advancements in construction simulation theory as reported in literature. It also summarizes the key factors that contribute to successful inculcation of simulation in the construction management sector, and it emphasizes on the key attributes of the problems that primarily make them more amenable to simulation modeling than opposed to other tools. It also provides an overview of long-term simulation initiatives leading the way to the next generation of computer modeling systems for construction sector; undoubtedly simulation plays an integral role in a futuristic vision of automated project planning and control.

II. Previous Work

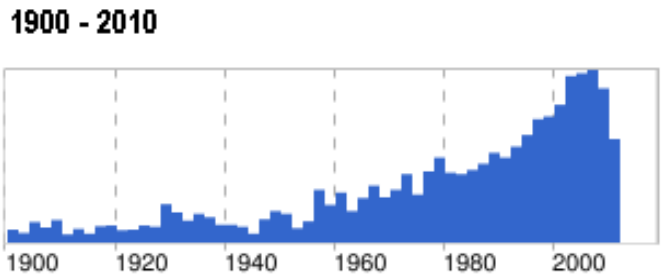

Figure 1 : Timeline Diagram of work done in Simulation

The initiative for the development of the simulators for construction management work took up from 1900. First successful model for simulator was built in 1969 by A.Gaarslev. Since then a considerable efforts were made to enhance the use of simulated tools for efficient modelling of realist construction environments as shown in Figure 3 [7].In August 1969, when A.Gaarslev & Stochastic proposed the model for estimating the production of material handling systems in Technical Report No.II at the Construction Institute, Stanford University.

In 1973, with the introduction of CYCLONE (CYCLic Operation NEtwork) methodology, the interest in the application of computer simulation in construction began. In Aug 1983 Paulson, BC, SA Douglas, A. Kalk, A. Touran and GA Victor published a paper on "Simulation and Analysis of Construction Operations" which emphasized that simulation analysis with disturbance scenarios not only identify critical disturbances but also can examine the dynamic system behaviour of construction operations.

Interactive Design Systems (IDS), which was founded in 1987, developed Bridge Engineering software that comprised of unique & important capabilities along with time-dependent construction simulation. Oloufa, AA published a paper on "A Framework for the Operational Simulation of Construction Projects" in Technical Report #13, at University of California in Berkeley in Mar 1988. Alciatore D, Hughes P, Traver A, and O'Connor J, published a paper on "Development and Simulation of an Ergonomic Control System for a Large Construction Manipulator" in the year 1989. A paper on "Computer-Based Process Simulation of Construction Activities" was published at ASCE Construction Congress, Minneapolis in Oct 1997.

In the year 2007, a French architect believed that he had finally solved one of the most puzzling

construction problems to reconstruct a three-dimensional simulation of how the granite blocks and great limestone of the pyramid were put together stone by stone. "A framework for real-time simulation of heavy construction operations" was published in the Proceedings of the 40th Conference on Winter Simulation Miami, Florida by Lingguang Song, Fernando Ramos, Katie Arnold. The paper described a framework of real-time simulation for simulation and modeling heavy construction activities. In comparison to the traditional simulation that uses static inputs, the capability of real-time simulation to dynamically embed new project data and the capability to adapt to the modifications in the operating environment to improve the accuracy of project forecasting.

In Sep 2009, a new construction training centre "the ACT-UK Simulation Centre" was set up in Coventry that was built to help construction managers develop their people management skills and enable them to fully develop their potential. Great turning point in the simulation field came out lately by 2010 when a sophisticated computer simulation program was used to develop an eight-phase construction plan to minimize disruptions.

III. Motivation

There has been extensive research done in the field of Construction Management through Simulation Process. Some of these studies have led to the production of practical computer-based simulation systems and various Simulation games that provide interactive games for various aspects of the management of construction projects to various firms and users learning the field. A review of the previous research and literature on these systems enlightened earlier showed that there has been very little research work aimed at producing a specific simulation system that tracks the totality of the decision making of site management at the user level. This projected work first presents the findings of the review and describes a logical model of a Construction system along with a prototype whose results can be justified on the Real Time Front. The research and development effort required to develop the prototype into a Working simulator to be further enhanced and then made use in industry is then elucidated.

The motivation of the projected work was extracted from various available Simulation Games like SimCity (The City Building Simulator) and Construction Destruction. The outlay of these games was blended in a system that provided the look and feel of these games, The innovative approaches and animation rends were taken as inspiration to give in an informative as well as an impressive appearance to the Simulator along with hat it was blended with the approaches of various Database Management Soft ware's to establish user interactiveness with the system and system's consistency with the database.

The parameters to define the efficiency of the software just in case to make it correlate with the Real World Scenarios are taken from the various Research and Development Projects like teaching construction management through games alone: a detailed investigation, Case Based Simulation of Construction Processes, CORBA, Using situational simulations to collect and analyze dynamic construction management decision-making data

a) VCS

The Virtual Construction Simulator – "A simulation game for construction engineering education" Understanding the dynamic nature of the construction process and the ability to make important decisions about resource utilization, sequencing, site layout, and project-related risks are critical skills for design and construction engineering students. The increase in projects complexity and shorter schedules pose pressure to develop more efficient construction methods, and also many challenges to educators to prepare students to manage these multifaceted processes.

The goal of this proposed project is to improve engineering education in building and construction through the use of interactive construction project simulation game. The goal is to create an experiential simulation environment where students can make decisions about resources, methods, cost/time trade-offs and related risks; and observe the impact of these decisions over time; thus actively learning to manage various factors that impact construction schedules. The immediate feedback will allow students to track their own progress, while the competition and scoring will introduce fun for more engaged, motivated and deeper learning of complex construction concepts.

IV. Methodology

In the initial study, it is determined that the work zone visualization and the simulation program could yield more benefits and expanded usage. The Simulation dataflow diagram is shown in Figure 2. The end user can select the sequence of actions to be performed at construction site. After that, the sequence is validated to check if some real time output could be generated.

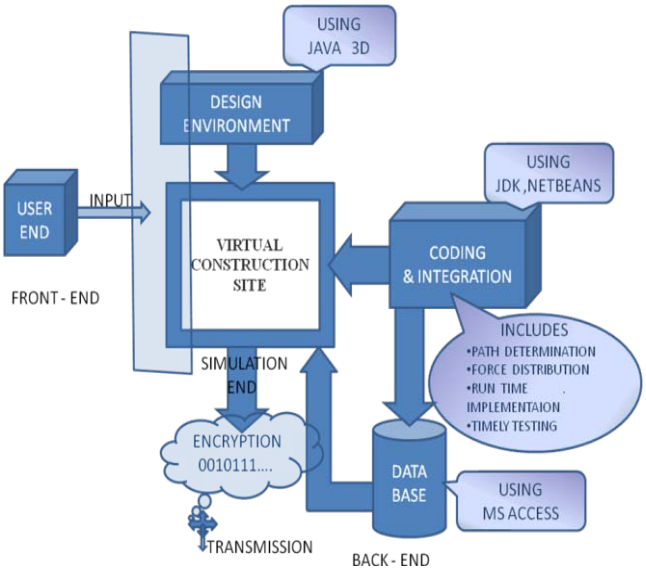

Figure 2 : Simulation Diagram

The simulator is closely integrated with JDK with the help of which it could easily determine the path and force distribution. The implementation is done at the run time and timely testing has been performed to ensure the feasibility. At the backend, MS-Access is used to store the temporary information regarding the motion of the bots, their path traversals, coordinate location of the static elements like walls, boundary and of the dynamic elements including the bots and the load. At the simulation end, the output of the calculations is transmitted to the robot in an encrypted form. The receptors received this output and accordingly gave instructions to the robot to perform the task required.

The construction site somewhat resembled a maze where bots are placed at different locations as shown in Figure 6. The bots actually imitated the vehicles present at the construction site for loading and unloading and various other tasks [9]. The simulator did the work of scanning this maze and identified the paths, bots and the load. Then calculations were performed to find out the optimal path to make the bots reach their respective destinations without colliding with each other.

The speed of the bots has been maintained by the simulator. Based on programmed algorithms, some vehicles increased or decreased their velocities if their conditions are met. As soon as all the bots reached their destination, work began according to the valid sequence of actions given by the end user. As the first task was completed, an event wss triggered for the next task to be accomplished after that.

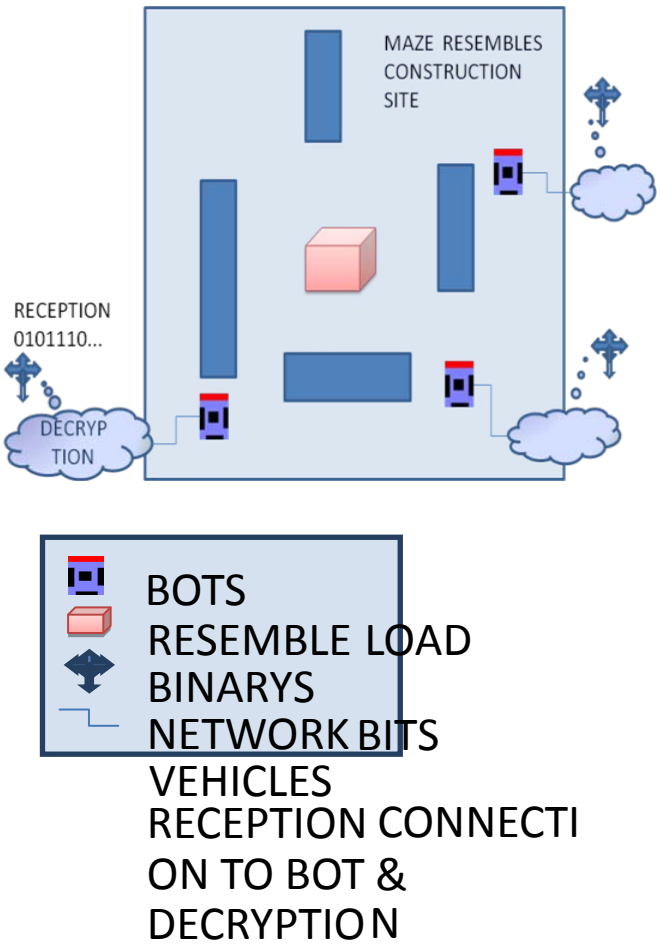

Figure 3 : Construction Site View Sensitivity Model [20]

After all the activities were completed in the simulator, the output was transmitted to the bots in encrypted form to perform the desired task where after the bots decrypted the binary information into necessary Kielcode to operate upon so as to accomplish the task of trans locating the load. Timely snapshots of the maze were taken to verify the desired operation of the bots and any necessary correction was heeded to [10].

V. Construction Plan

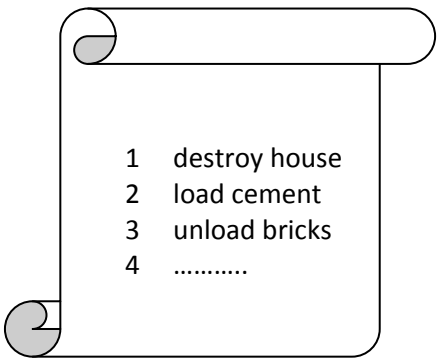

Figure 4 : A Sample Construction Plan

A construction plan is a sequence of steps that are to be performed to carry out a task with the

cumulative effort of various dynamic elements working cumulatively in a synchronous manner. Here in we assumed the task of creating a multistory building after destroying a house. So the task can be fragmented into various steps as in destroying the house, loading bricks and cement from Factory, unloading them at the construction site, constructing the Multi storey building, moving the waste to the recycler.

Now the job of the user is manage the construction mechanism so as to complete the task as soon as possible with most efficient use of fuel and with a certain constrained number of vehicles. To avoid the burden of management by hand or by any other tool this Simulator is developed where in the user can practice any number of Construction plan by merely feeding in the fragmented tasks as the input and then perform the comparative study analyzing the best plan amongst them.

Attributes involved in the Construction Plan:

- Process – ID
- Name of the vehicle involved
- Source location of the Vehicle
- Destination location of the Vehicle
- Task to be Performed by the Vehicle

VI. Construction – Simu

Construction Management is a hybrid, in which engineering analytical reasoning needs to blend with the real world business approach, hence it is logical to assume that teaching methods used in Schools of Business/Management can be brought to relevance. Both in construction and business programs there is a common goal of teaching professionals how to perform and succeed in real world situations.

This blended management approach to Construction Management instruction should involve the development of a set of philosophies, approaches, skills, knowledge, and techniques. This is best served by the Simulation method – a teaching approach that helps to provide knowledge and experience with techniques that can be displayed on a projector the operations can be minutely viewed and evaluated on demand. The simulation can be controlled by the user input and worked upon by extensive controls involving pausing the operation as well as rolling back the process to certain breakpoint for any sort of intermediate updation[20].

Certain characteristics of the Simulated System:

- Construction Simu is a 3-D virtual Reality environment of a Construction Site.
- It provides the users to employ their Construction Management Skills to design a Construction Plan.
- It interacts with the user to fed in the sequence of operations that control the flow of commands.
- The flow of information takes place between the user and the system as well as the system and the database that stores the intermediate status.
- The Simulator implements the Construction Plan in a Cascaded Representation where different Canvases are interconnected to transfer of information regarding Dynamic elements of the Simulator.
- It performs comparative study of the various Construction Plans can be made on the basis of Time Consumption, Net Distance traversed by the vehicles.

VII. Objective

Construction planning is a very fundamental and as well a challenging activity in the execution as well as in the execution of construction projects. The choice of technology, the identification of any interactions among the different work tasks, the definition of work tasks, durations of the tasks and the estimation of the required resources for individual tasks are involved in it's core planning objectives. A good construction plan is definitely the basis for developing the budget and the schedule for work. The most critical task in Construction Management is to develop a Construction Plan, even if the plan is not written or otherwise formally recorded. In addition to these technical aspects of construction planning, it is also necessary to make organizational decisions about the relationships between project participants and even which organizations to include in a project. For example, the limit to which laborers will be used on a project is often calculated during construction planning.

The primary objective of this simulated work is to design a Construction Plan for the user who intends to implement that plan on the Real world environment. There could be various sequence of events to processed in that Construction Plan and with lots of Permutations and Combinations of these events we design several Construction Plans to be tested in the environment.

So the ultimate objective of the user is obtain the most efficient and optimal Construction Plan evaluated by the System amongst the various available options to the user. Each alternative is implemented on the Simulator in minute details where in each fragmented subtask is viewed and the related information is punched in the database for evaluation and log purpose.

Using the information stored parameters(here in the cost induced by the user) are decided to compare the plans and determine the best amongst them to be transmitted to the Real World environment so as to be implemented.

VIII. Working

The construction simulator is a multi-cascaded environment with four canvases that can intercommunicate in terms of dynamic elements that are the vehicles travelling from one canvas to other and the information regarding them.

The Simulator is also inculcated with two gadgets one for demonstrating the status of the user as well as providing the information about all the dynamic elements being used by the user.

The other gadget provides the tools for the user to feed in commands for carrying out the operations like destroying the house, loading the bricks etc. It also keeps track of the progress of the commands issued indicating the measure of task completion.

Users can experiment various construction plans and implement them on the simulator and the task of simulator is to provide the comparative study of the various plans implemented on the basis of distance travelled or the fuel consumed and the time taken to execute the plan.

The user is equipped with two gadgets to interact with the system so as to control it and force it the way he wants the operations to be processed. The gadgets are named as Gadget1 and Gadget2. The former takes in the input from the user for the designing of the Construction Plan whereas in the later one the user addresses the name of the Vehicle to be queried and all the details about the vehicle is presented before him[20].

Now the System is also in correspondence to a Microsoft Access Database via JDBC driver to store the intermediate information to update the status of System as well as to compare and hence evaluate the most optimal option.

The key Features stored at the Back- End includes:

- Details about the Users evaluating the Software.
- Details about the Tasks being performed by the current Logged in User.
- Details of the various Vehicles in action or in Passive State.

IX. Diagramatic Flow of Data User View

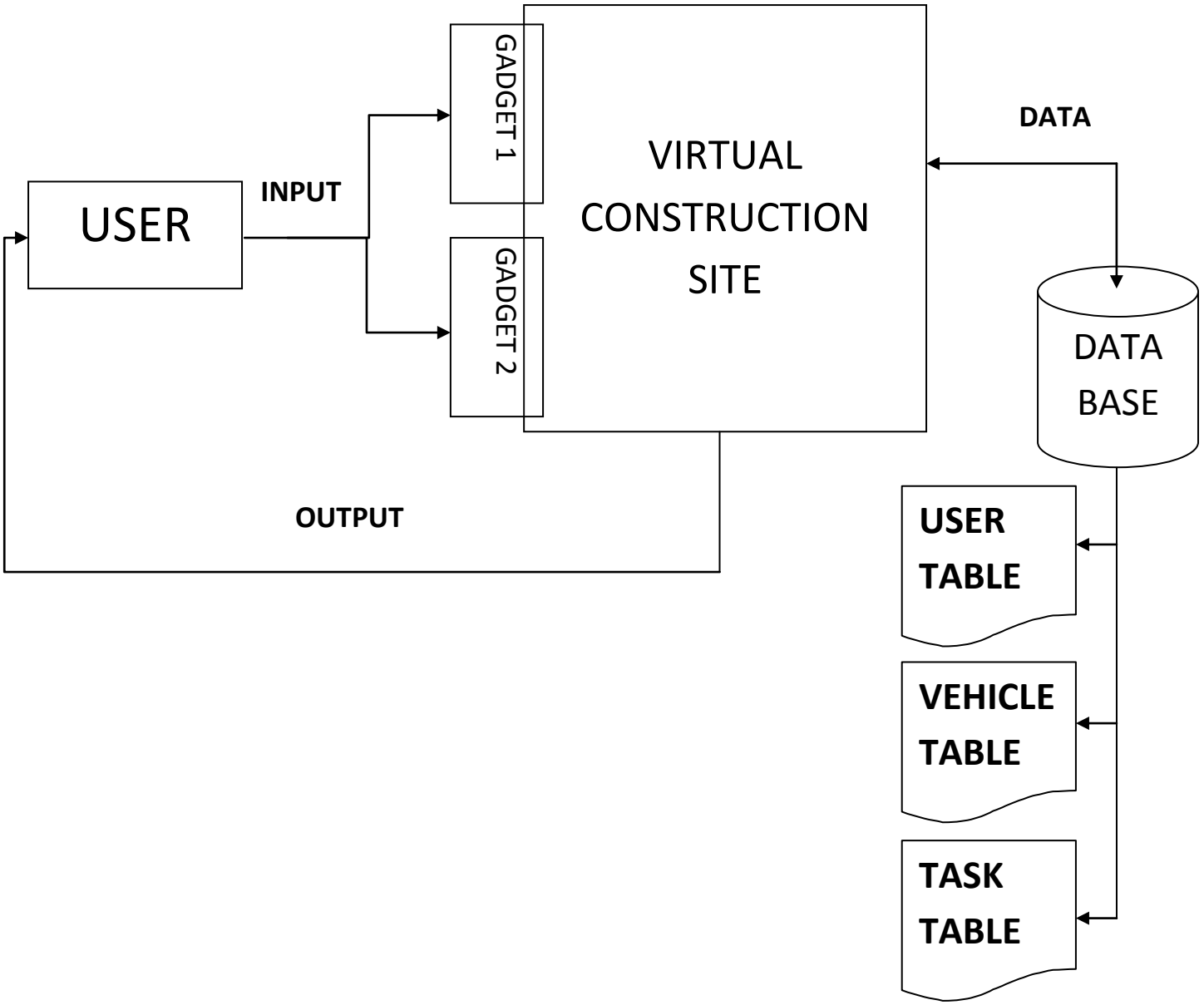

Figure 5 : Diagrammatic flow of data user view

- Virtual Construction Site is the VDU of this simulated system, which interacts or communicates with the input units hat is the gadgets, the back end repository as well as the design Mechanism[20].
- The input units are the two Gadgets that are a part of the Visual Site and are deeply integrated with them and connected to the Database internally, The former gadget is a interaction `tool that feds in all the necessary details regarding the task to be commenced, the details include name of vehicle undergoing the task, source location and the destination of the vehicle and the task to be performed.

A series of inputs can be combined to form a construction plan such that all the tasks defined in that plan work concurrently to execution. One thing to be kept in mind is that no two tasks can be performed on the same vehicle simultaneously, if so forces the system to issue an error message. Also certain constraints regarding the nature of task have been inbuilt such that a truck can only be used for loading and unloading purpose whereas the crane for destroying the house etc. and no task that does not correspond to its vicinity can be issued if done so again an error message is issued. Once the plan has been submitted it can be started, cleared and stopped as per the need of the user

The later gadget is an information tool which interacts with the user to input the name of the vehicle and displays all the records regarding that vehicle including its name location, fuel contained and its distance from the petrol Pump.

- The output of the System is recorded in the database in the form of cost inculcated by the user initially in the form of vehicles bought by him and additional cost of refilling the tank of vehicles.

The Database used is a Microsoft access repository that comprises of three tables namely:

- User Table: Storing the details of the user including his name his password and his net worth and expenditure done till that moment.
- Task Table: Storing the information about each task whether queued, accomplished or in progress, the intermediate status of each task is updated in intervals. This information is tracked for the VDU to display the execution of task on the Monitor screen as well as to evaluate the final results of the comparative study made by System [20].
- Vehicle Table: This table is primarily designed for the second gadget, all the information about each vehicle including I's ID, Name, Fuel and Fuel capacity it's Mileage and location are stored in this table. The values of second gadget are updated from the intermediate values stored in this table.

X. Diagramatic Flow of Data Site View

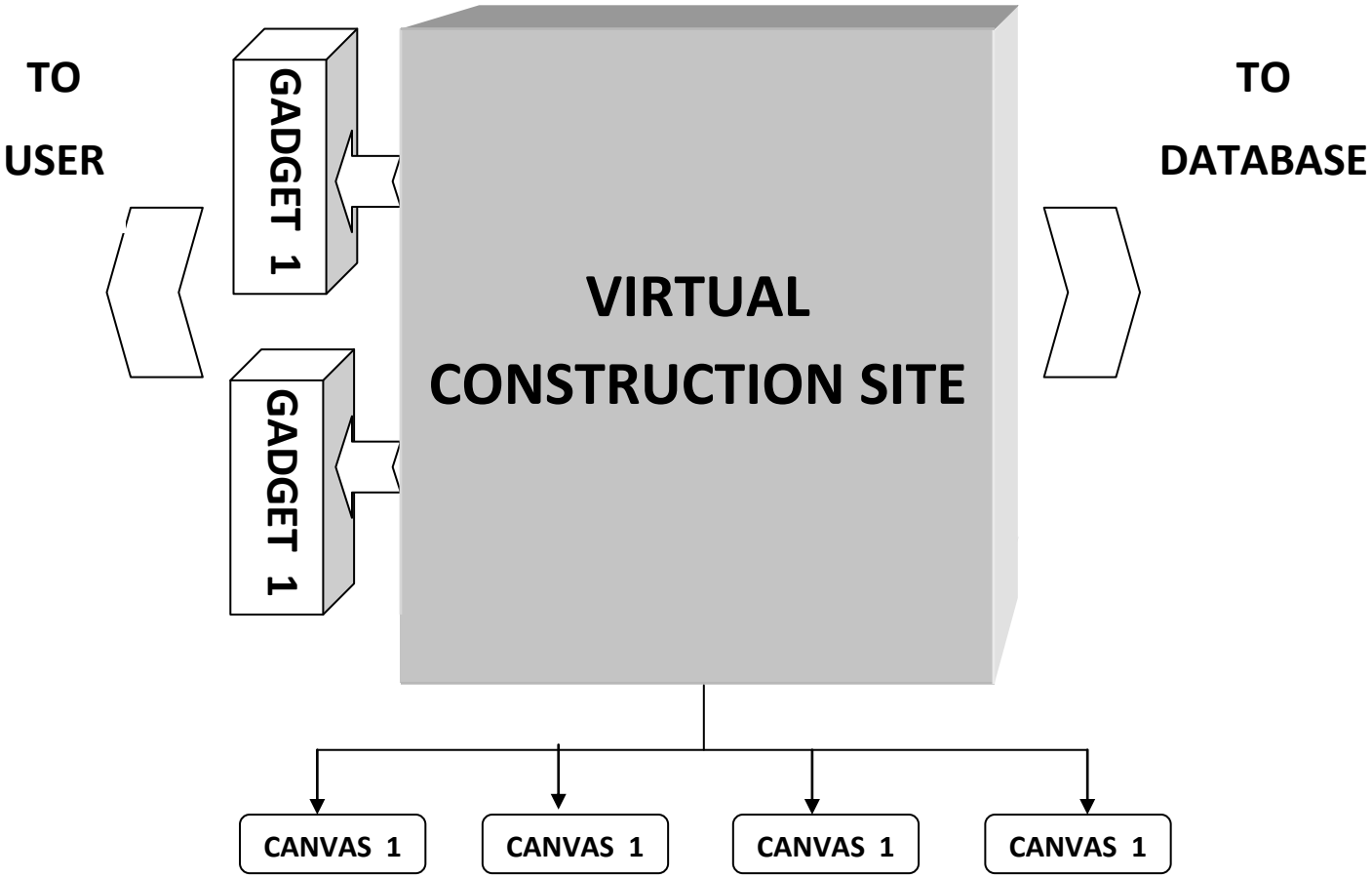

Figure 6 : Diagrammatic flow of data Site view

Going into depth of the Virtual Construction Site, we come across that the main Visual Environment is defined and designed in Disp class, embedding The two Gadget classes ad the four Canvass classes.

a) Inside the Code

DISP : Disp is a java class which extends the Frame class of Java. Swings Package [20]. This class presents the base of the Visual System with the black Background, this class embeds the four canvases for displaying the four different locations of the real time environment in a multi cascaded format. Each canvas can communicate with each other and share information in a consistent manner. The updates made in one canvas are to be updated in the others as well.

When a vehicle moves from one vehicle to other the data also is transferred from that canvas to other canvas along with the updation in the global database about the updation of the information.

The dynamic elements that is the various vehicles are embedded as labels in the main base class but their location is stored relative to various canvases in the back end.

CANVAS : There are for canvas classes namely Canvas1, Canvas2, Canvas3 and Canvas4. Each canvas represents a different location of the real world. The Canvas class is Java class that extends Jpanel Class in Java.swings package it consists of all the static elements embedded as images on the labels.

Canvas 1: this is the representation of the construction site displaying house to be destructed and then a multi storey building to be construced at its place.

Canvas 2: this is the representation of the Factory where in the trucks are used to load and unload various building materials like cement and bricks.

Canvas 3 : this is the representation of the Petrol Punm where in any vehicle can drive in to refill it's tank.

Canvas 4 : this is the representation of the Recycler Plant where in the waste cressure generated can be brought out over here and Recycled.

GADGET : There are two gadgets invoked in the base class, they can be slidded and brought into focus by the two side buttons available. The Gadget class is again a JPanel class purely designed by labels, TextFields and Buttons in Netbeans to give a user Interactive interface to the user. The user can fed in the details of the tasks and view the information of the vehicles in these gadgets.

XI. Sample execution

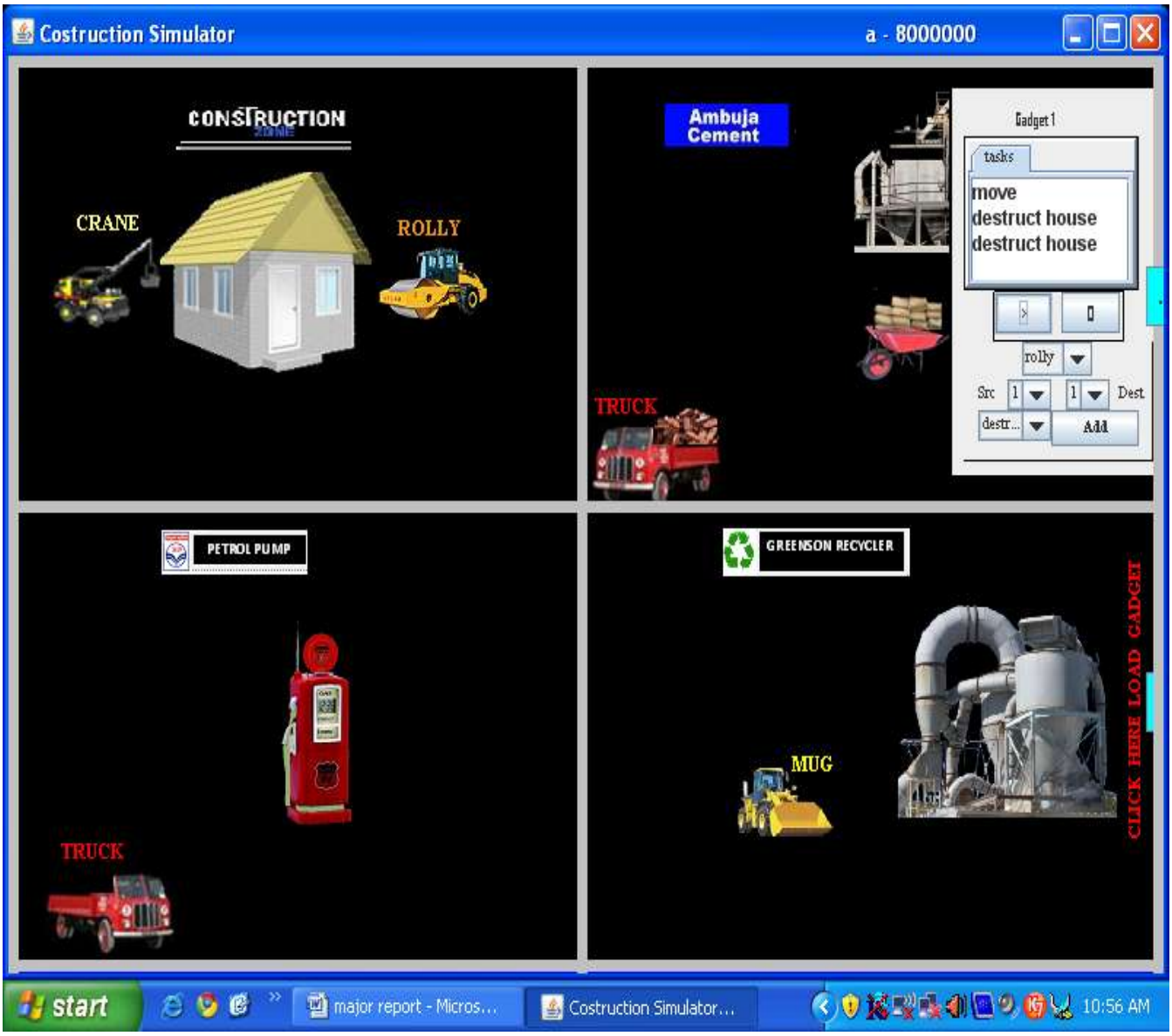

Figure 7 : Screen Shot Construct-Simu [20] (Sample Execution)

XII. List of Inputs

Vehicle	Task	Source	Destination
Truck1	load bricks	2	2
Crane	destroy house	1	1
Rolly	destroy house	1	1
Truck2	move	3	4
Truck1	unload bricks	1	1
Truck1	load cressure	1	1
Truck2	load cement	2	2
Truck1	move	1	4
Truck2	move	2	1
Truck1	unload cressure	4	4
Truck2	unload cement	1	1
Mug	recycle	4	4
Truck1	move	4	3
Truck2	load cressure	1	1
Truck1	refill fuel	3	3
Truck2	move	1	4
Truck2	unload cressure	4	4
Mug	recycle	4	4
Truck2	move	4	3
Truck2	refill fuel	3	3

XIII. Conclusion

a) On the Basis of Results

The results suggest User A had to spend more cost due to another extra vehicle where as User B cutting his cost wasted lot of time which when multiplied to a factor for implementing in Real world would indeed be a greater loss.

Also the sequence of tasks were restricted to testing perspective in real time operations the number of tasks performed at the site is much larger in number and hence the cost of an extra vehicle will be fruitful as we can see using two trucks we needed two refills each while using one truck it required 5 refills.

Undoubtedly User a employing Multi-Tasking by using an extra vehicle is a better and efficient manager of Construction events.

b) On the Basis of Use

Computer simulations can provide students in construction management the opportunity to experience management and business decision making. Simulations allow the users to analyze the results, discuss different strategies, and see the result of planning and implementation of business bid strategies. This simulation is a work in progress and continued development is being done to date.

Additional functionality in the area of obtaining negotiated work, increased complexity of the project management piece, and expanding the types of projects to include other segments of the construction industry; i.e. heavy civil and highway construction, are the next pieces to be completed. It is anticipated that this simulation will be available to the Associated School

of Construction programs on a measured access basis in early 2003. The simulation has under gone thorough testing and is working up to expectations, but as with any work in progress, it will greatly benefit from input from the anticipated new users and individual instructors.

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To avoid postal delays, all transaction is preferred by e-mail. A finished manuscript submission is confirmed by e-mail immediately and your paper enters the editorial process with no postal delays. When a conclusion is made about the publication of your paper by our Editorial Board, revisions can be submitted online with the same procedure, with an occasion to view and respond to all comments.

Complete support for both authors and co-author is provided.

4. MANUSCRIPT'S CATEGORY

Based on potential and nature, the manuscript can be categorized under the following heads:

Original research paper: Such papers are reports of high-level significant original research work.

Review papers: These are concise, significant but helpful and decisive topics for young researchers.

Research articles: These are handled with small investigation and applications

Research letters: The letters are small and concise comments on previously published matters.

5.STRUCTURE AND FORMAT OF MANUSCRIPT

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:

Papers: These are reports of significant research (typically less than 7000 words equivalent, including tables, figures, references), and comprise:

(a)Title should be relevant and commensurate with the theme of the paper.

(b) A brief Summary, "Abstract" (less than 150 words) containing the major results and conclusions.

(c) Up to ten keywords, that precisely identifies the paper's subject, purpose, and focus.

(d) An Introduction, giving necessary background excluding subheadings; objectives must be clearly declared.

(e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition; sources of information must be given and numerical methods must be specified by reference, unless non-standard.

(f) Results should be presented concisely, by well-designed tables and/or figures; the same data may not be used in both; suitable statistical data should be given. All data must be obtained with attention to numerical detail in the planning stage. As reproduced design has been recognized to be important to experiments for a considerable time, the Editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned un-refereed;

(g) Discussion should cover the implications and consequences, not just recapitulating the results; conclusions should be summarizing.

(h) Brief Acknowledgements.

(i) References in the proper form.

Authors should very cautiously consider the preparation of papers to ensure that they communicate efficiently. Papers are much more likely to be accepted, if they are cautiously designed and laid out, contain few or no errors, are summarizing, and be conventional to the approach and instructions. They will in addition, be published with much less delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and to make suggestions to improve briefness.

It is vital, that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

Format

Language: The language of publication is UK English. Authors, for whom English is a second language, must have their manuscript efficiently edited by an English-speaking person before submission to make sure that, the English is of high excellence. It is preferable, that manuscripts should be professionally edited.

Standard Usage, Abbreviations, and Units: Spelling and hyphenation should be conventional to The Concise Oxford English Dictionary. Statistics and measurements should at all times be given in figures, e.g. 16 min, except for when the number begins a sentence. When the number does not refer to a unit of measurement it should be spelt in full unless, it is 160 or greater.

Abbreviations supposed to be used carefully. The abbreviated name or expression is supposed to be cited in full at first usage, followed by the conventional abbreviation in parentheses.

Metric SI units are supposed to generally be used excluding where they conflict with current practice or are confusing. For illustration, 1.4 l rather than 1.4 × 10-3 m3, or 4 mm somewhat than 4 × 10-3 m. Chemical formula and solutions must identify the form used, e.g. anhydrous or hydrated, and the concentration must be in clearly defined units. Common species names should be followed by underlines at the first mention. For following use the generic name should be constricted to a single letter, if it is clear.

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Abstract, used in Original Papers and Reviews:

Optimizing Abstract for Search Engines

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Key Words

A major linchpin in research work for the writing research paper is the keyword search, which one will employ to find both library and Internet resources.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy and planning a list of possible keywords and phrases to try.

Search engines for most searches, use Boolean searching, which is somewhat different from Internet searches. The Boolean search uses "operators," words (and, or, not, and near) that enable you to expand or narrow your affords. Tips for research paper while preparing research paper are very helpful guideline of research paper.

Choice of key words is first tool of tips to write research paper. Research paper writing is an art.A few tips for deciding as strategically as possible about keyword search:

- One should start brainstorming lists of possible keywords before even begin searching. Think about the most important concepts related to research work. Ask, "What words would a source have to include to be truly valuable in research paper?" Then consider synonyms for the important words.
- It may take the discovery of only one relevant paper to let steer in the right keyword direction because in most databases, the keywords under which a research paper is abstracted are listed with the paper.
- One should avoid outdated words.

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Numerical Methods: Numerical methods used should be clear and, where appropriate, supported by references.

Acknowledgements: Please make these as concise as possible.

References

References follow the Harvard scheme of referencing. References in the text should cite the authors' names followed by the time of their publication, unless there are three or more authors when simply the first author's name is quoted followed by et al. unpublished work has to only be cited where necessary, and only in the text. Copies of references in press in other journals have to be supplied with submitted typescripts. It is necessary that all citations and references be carefully checked before submission, as mistakes or omissions will cause delays.

References to information on the World Wide Web can be given, but only if the information is available without charge to readers on an official site. Wikipedia and Similar websites are not allowed where anyone can change the information. Authors will be asked to make available electronic copies of the cited information for inclusion on the Global Journals Inc. (US) homepage at the judgment of the Editorial Board.

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The Editorial Board and Global Journals Inc. (US) recommend the use of a tool such as Reference Manager for reference management and formatting.

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the search? Will I be able to find all information in this field area? If the answer of these types of questions will be "Yes" then you can choose that topic. In most of the cases, you may have to conduct the surveys and have to visit several places because this field is related to Computer Science and Information Technology. Also, you may have to do a lot of work to find all rise and falls regarding the various data of that subject. Sometimes, detailed information plays a vital role, instead of short information.

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11. Revise what you wrote: When you write anything, always read it, summarize it and then finalize it.

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19. Know what you know: Always try to know, what you know by making objectives. Else, you will be confused and cannot achieve your target.

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21. Arrangement of information: Each section of the main body should start with an opening sentence and there should be a changeover at the end of the section. Give only valid and powerful arguments to your topic. You may also maintain your arguments with records.

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.

23. Multitasking in research is not good: Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

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.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be

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32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

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.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- 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.

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General style:

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

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· 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

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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.

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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:

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- 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
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- 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:

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- 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.
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- 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.

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- Report the method (not particulars of each process that engaged the same methodology)
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- 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.

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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.

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- 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.
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What to stay away from

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- 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.

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- 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

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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.

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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
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References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

Index

V

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