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Implementation of Extracted Timing

Discovering Thoughts, Inventing Future

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HARDWARE AND COMPUTATION

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Implementation of Extracted Timing Methodology on Process Monitor for Silicon Characterization

By Bhagyasri Chandaka & Dr. R. Ramana Reddy

Abstract- Process variations are playing a key role in defining the behaviour of an IP. These process variations can accurately measure using process monitor. In order to verify process variations, the process monitor should meet all timing requirements. Static Timing Analysis (STA) uses best case/ and worst analysis overly pessimistic, and could be optimistic also in some cases. Static Timing Analysis (STA) is a method for estimating yield of a circuit in terms of timing activities. Model extraction is a technique that accurately captures the characteristics of interface logic of a design in the form of a timing library model and provides a capacity improvement in timing verification by more than two orders of magnitude. Extracted timing model is an efficient timing library model to get accurate timing arcs of the circuit. This paper describes Methodology for creating timing models and also the flow to develop IP (process monitor) ETMs (.lib) using Synopsys Primetime tool, which can be used in any SOC and ETMs (Extracted timing models) with necessary time-budgeting instead of IP Netlists. Generated ETM with and without annotation delays and compared the library file. And the process monitor's ring oscillator is designed through Verilog code using cadence tool.

Keywords: back annotation, ETM, ILM, process monitor, QTM, ring oscillator, STA.

GJCST-A Classification: B.7.m



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Implementation of Extracted Timing Methodology on Process Monitor for Silicon Characterization

Bhagyasri Chandaka ^α & Dr. R. Ramana Reddy ^ο

Abstract- Process variations are playing a key role in defining the behaviour of an IP. These process variations can accurately measure using process monitor. In order to verify process variations, the process monitor should meet all timing requirements. Static Timing Analysis (STA) uses best case/ and worst analysis overly pessimistic, and could be optimistic also in some cases. Static Timing Analysis (STA) is a method for estimating yield of a circuit in terms of timing activities. Model extraction is a technique that accurately captures the characteristics of interface logic of a design in the form of a timing library model and provides a capacity improvement in timing verification by more than two orders of magnitude. Extracted timing model is an efficient timing library model to get accurate timing arcs of the circuit. This paper describes Methodology for creating timing models and also the flow to develop IP (process monitor) ETMs (.lib) using Synopsys Primetime tool, which can be used in any SOC and ETMs (Extracted timing models) with necessary time-budgeting instead of IP Netlists. Generated ETM with and without annotation delays and compared the library file. And the process monitor's ring oscillator is designed through Verilog code using cadence tool.

Keywords: back annotation, ETM, ILM, process monitor, QTM, ring oscillator, STA.

I. INTRODUCTION

SOC contain some analog and digital circuitry in the form of pre-designed blocks commonly known as intellectual property (IP). Soft IPs are processor cores, peripheral interfaces etc. and Hard IPs are analog blocks like PLLs etc. There are different challenges for SOC timing closure when multiple IPs is integrated. Soft IPs is implemented by performing synthesis, constraints and timing analysis followed by back-end process. Whereas Hard IPs requires set of views that provide appropriate information of IP at each stage that are used. SOC timing can be implemented in following ways.

1. Flat timing approach
2. Hierarchical timing approach

Flat timing approach will consume more time and becomes complicated at initial timing analysis when the designer go for larger designs with many IPs (As we read gate level netlist, SDC, SPEF). Once IPs timing is closed any how designer do Timing signoff on flat design. This paper describe the methodology for SOC

timing closure using hierarchical approach, which generates IP hierarchical timing models and used for SOC level to close interface timing. This way it helps us faster timing convergence at SOC level. Process monitor includes a variety of test structures in the form of ring oscillators developed to easily integrate into SoC designs. The PVT conditions of silicon can be change from layer to layer or from lot to lot. In this paper section-2 presented the basic structures of process monitor's ring oscillator and how to interface the process monitor with the SOC. Timing extraction plays an important role in the hierarchical analysis flows by reducing the complexity of timing verification.

L.T.N.wang shows implementation of process monitor's ring oscillator sensitive frequency layout dependency nature using gate lithography [2]. Cristiano Forzan, Davide Pandini shows a solution that is the design performance with variability problem of accurately evaluating is statistical static timing analysis (SSTA). Based on the probability function the timing analysis run time is estimated in a single run[3]. R. Saleh, S. Wilton, S. Mirabbasi shows the process of creating a reusable IP block, differs from the traditional ASIC design, implementation of reusable IPs takes more time but these IPs can use in any SOC [6]. Cho W. Moon, Harish Kriplani and Krishna Belkhale shows timing model extractor builds a timing model of a digital circuit for use with a static timing analyzer. And the implemented structure easy to analyse and which reduces the run time and complexity of the SoC [4]. So the efficient timing methodology, Extracted Timing Methodology (ETM) implementation on process monitor is discussed in this paper. And also the implementation of process monitor's ring oscillator and delay calculations are discussed. Since run time of circuits timing analysis depends on the timing library files of the IPs, by considering the ETM libs the run will reduce.

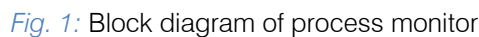
II. ARCHITECTURE OF PROCESS MONITOR

Process monitor includes a variety of test structures in the form of ring oscillators developed to easily integrate into SoC designs. Each process monitor can be instantiated several times in a single chip. The IP supports JTAG and Direct Access interfaces only, for easy integration. Typical process monitor applications

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- Ring Oscillators (RO)
- Digital block for controllability and observability

2



The purpose of the ring oscillator is to characterize the performance and behaviour of the key transistors across the die. Each ring oscillator (RO) makes use of classical ring oscillator structure of the core. The purpose of the ring oscillator is to characterize the performance and behaviour of the key transistors across the die. Ring oscillator structure as the core, for the process measurement along with additional peripheral circuit.



b) Delay calculations

- Each RO has a 4-bit ripple divider; number of divider stages “M” (4).
- Number of stages in the ring oscillator being characterized “A”.
- TM has a 8-bit Ripple divider in the test module; number of divider stages “N” (8).
- 24-bit output counter – CDIV.
- The maximum ring frequency is < 5GHz.
- Choose reference frequency that is at least 10 MHz
- Start Timer Value w.r.t reference frequency, which indicates when to start counters (START_VAL).
- Stop Timer Value w.r.t reference frequency, which indicates when to stop counters (STOP_VAL).

The RO frequency in each test structure is given by:
Frequency of RO

$$F_{\text{ring_osc}} = \frac{2^{M+N} \times F_{\text{ref}} \times \text{CDIV}}{\text{STOP_VAL} - \text{START_VAL}} \quad (1)$$

Average gate delay of each ring gate:

$$T_{\text{pd}} = 0.5 \times \frac{1}{A \times F_{\text{ring_osc}}} \quad (2)$$

The start and stop timing information is available in the registers which are in process monitor and programmed through JTAG. The counters will counts the number of clock pulses arrived between the start and stop time. By using above formula one gate delay can be calculated. The simulations results are

shown in the below section, which are generated in cadence Verilog tool.

c) Simulation Results

REF_clk time period is 20ns. 12-bit counter will count upto 4096. For 23 chain Ring Oscillator, DA_OUT time period is (2x23x4096) 188.416ns and for 101 chain Ring Oscillator the DA_OUT time period is (2x101x4096) 827.392ns which is shown in the fig 3 and fig 4. Delay of the gate is calculated by using the equation (1). One gate delay is 1ps and time period is 2ps. DA_CLKOUT shows the output frequency of ring oscillator which is shown in the fig 3. TDI, TDO, CAPTURE, SHIFT AND UPDATE are the interface signals.

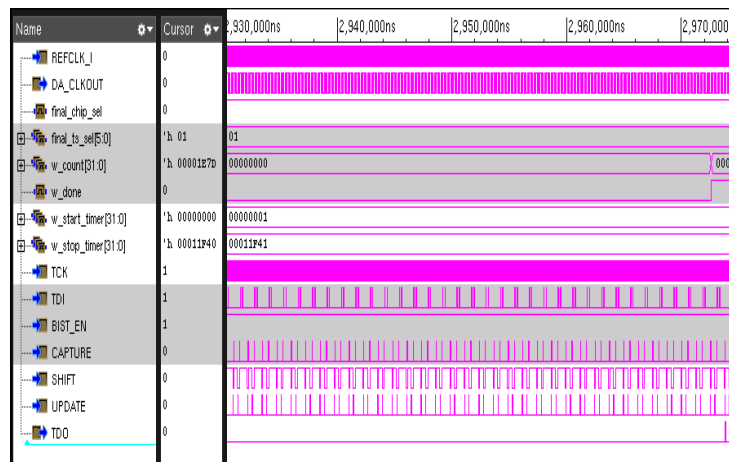


Fig. 3: Process monitor JTAG interface simulation waveforms

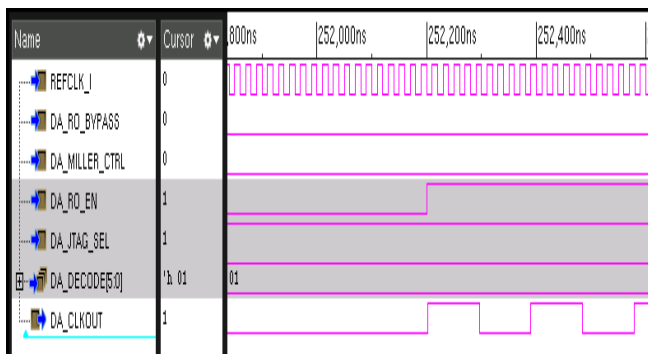


Fig. 4: Process monitor's DA (Direct Access) interface simulation waveforms

III. STATIC TIMING ANALYSIS (STA)

Static timing analysis is a method of validating the timing performance of a design by checking all possible paths for timing violations without having to simulate. No vector generation is required, no functionality check is done.

Timing models are to represent the timing characteristics of complex blocks in a design. A timing model of the block models the full input and output timing characteristics without the complete netlist of the

block. There are some timing models like QTM and ILM, which are used based on application.

a) Quick Timing Models (QTM)

In the early stages of the design cycle, if a block does not yet have a netlist, the designer can use a quick timing model to describe its initial timing. Later in the cycle, it can replace each quick timing model with a netlist block to obtain more accurate timing. To create a quick timing model the designer can use a series of Prime Time commands to specify the model ports, the setup and hold constraints on the inputs, the clock-to-output path delays, and the input-to-output path delays. It is also possible to specify the loads on input ports and the drive strength of output ports. The generated file can save a quick timing model in the Synopsys .db format, then instantiate the quick timing model in a design just as the designer would instantiate library cells or interface timing specification models.

b) Interface Logic Models (ILM)

An interface logic model (ILM) is a partial netlist that contains only the interface logic of a block. The ILM contains.

- The combinational logic from each input port to the first stage of sequential elements of the block.

- The combinational logic from the last stage of sequential elements to each output port of the block.
- The clock paths to these sequential elements.
- Combinational paths from the input ports that do not encounter a sequential element and directly to an output port.

A generated ILM is context-independent, which means that the model is accurate for a range of operating environments. When the model is used in a design, the timing behaviour of the model is different for different operating environments.

An ILM is a partial netlist that retains the combinational logic from each input or output port to the first or last stage of sequential elements of the block. The intent of an ILM is to produce a model that closely resembles the timing of the interface to that of the block-level netlist.

IV. EXTRACTED TIMING METHODOLOGY (ETM)

The designer can generate an extracted timing model (ETM) for a block with a corresponding technology-mapped gate-level netlist. Using extracted timing models provides the following benefits:

- Reduces the runtime and memory for full-chip analysis, the designer can run chip-level analysis with extracted models in place of the gate-level netlist for some modules.
- Protects the intellectual property of a netlist-based core.

Extraction uses a technology-mapped netlist as input and generates a context-independent timing model in the Synopsys .db format or Liberty format. The generated model contains the same timing behaviour as the original netlist. The delay values of arcs in the model are within the user-defined tolerance of the original path delays. The generation of ETM flow is represented in the fig 5.

To generate ETM timing lib, pre requisites are design constraint file, command script to perform step by step analysis and library files. If the generated model meets over timing requirements, then it can be used in any SOC. fig 6 represent the timing arcs model for ETM.

The delay data in the timing arcs is accurate for a range of operating environments. The extracted delay data does not depend on the specific values from input transition times, output capacitive loads, input arrival times, output required times, and so on. When the model is used in a design, the arc delays vary with the input transition times and output capacitive loads. This is called a “context-independent” model because it works correctly in a variety of contexts.

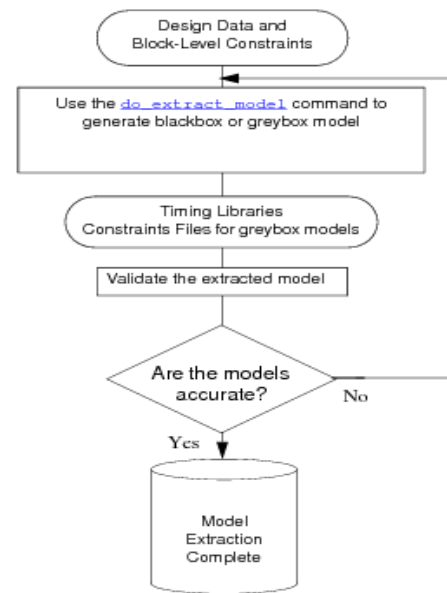


Fig. 5: ETM generation flow chart

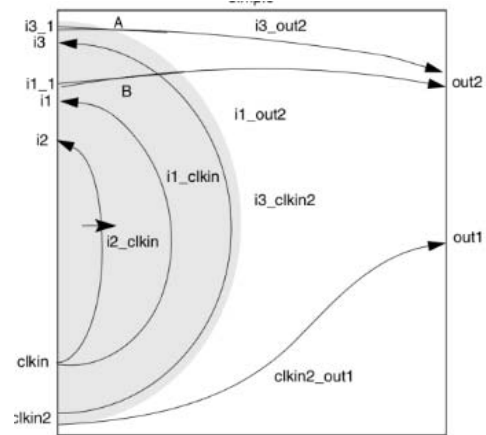


Fig. 6: ETM timing model of core cell

The characteristics of the ETM model depend on the operating conditions in effect at the time of extraction. However, clocking conditions and external constraints do not affect the model extraction process. There are some commands like create_clock, set_clock_latency, set_clock_uncertainty, set_input_delay, and set_output_delay, do not affect the model extraction process, but the extracted model, when used for timing analysis, is sensitive to those commands.

By specifying the annotation delay the timing analysis is more relevant to the practical conditions. That is after layout of the circuits resistance and capacitance values are added which increases the delay. In back annotation process these delay values also considered.

a) Back Annotation

Back-annotation is the process of reading delay, resistance, and capacitance values from an external file into the tool for timing analysis. Using back-annotation, the designer can more accurately analyze

the circuit timing in the tool after each phase of physical design. For initial static timing analysis, PrimeTime estimates net delays based on a wire load model. Actual delays depend on the physical placement and routing of the cells and nets. A floor planner or router can provide more detailed and accurate delay information, which the designer can provide to PrimeTime for a more accurate analysis. This process is known as back-annotation. And this delay information is often provided in an SDF file. The back annotation delay on the ports can be provided by specifying the `set_annotation_delay` command. Here the annotation delay is 50% of the time period.

```
pin("TDI") {
  direction : input ;
  max_transition : 50.000000 ;
  capacitance : 1.885365 ;

  /* Other user defined attributes. */
  original_pin : TDI;
  timing 0 {
    related_pin : "TCK" ;
    timing_type : setup_rising;
    rise_constraint(f_dtrans_ctrans){
      index_1 ( "0.000000, 3.088950, 7.836690, 19.881800, 50.000000");
      index_2 ( "0.000000, 2.422370, 5.442220, 12.226800, 50.000000");
      values( "498.858948, 497.792267, 496.238129, 492.614716, 476.830109",\
              "500.336609, 499.269928, 497.715790, 494.092377, 478.307770",\
              "502.833191, 501.766510, 500.212372, 496.588959, 480.804352",\
              "509.181091, 508.114410, 506.560272, 502.936859, 487.152252",\
              "520.603943, 519.537292, 517.983154, 514.359741, 498.575104");
    }
  }
  fall_constraint(f_dtrans_ctrans){
    index_1 ( "0.000000, 3.088950, 7.836690, 19.881800, 50.000000");
    index_2 ( "0.000000, 2.422370, 5.442220, 12.226800, 50.000000");
    values( "523.261780, 522.195129, 520.640991, 517.017578, 501.232941",\
            "524.642761, 523.576111, 522.021973, 518.398560, 502.613922",\
            "526.961731, 525.895081, 524.340942, 520.717529, 504.932892",\
            "532.568298, 531.501648, 529.947510, 526.324097, 510.539459",\
            "541.497620, 540.430969, 538.876831, 535.253418, 519.468750");
  }
} /* end of arc TCK_TDI_stnr */
```

Fig. 7: Timing arcs on TDI pin without annotation delay

```
pin("TDI") {
  direction : input ;
  max_transition : 50.000000 ;
  capacitance : 1.885365 ;
  /* Other user defined attributes. */
  original_pin : TDI;
  timing 0 {
    related_pin : "TCK" ;
    timing_type : setup_rising;
    rise_constraint(f_dtrans_ctrans){
      index_1 ( "0.000000, 3.088950, 7.836690, 19.881800, 50.000000");
      index_2 ( "0.000000, 2.422370, 5.442220, 12.226800, 50.000000");
      values( "548.755676, 547.689026, 546.134888, 542.511475, 526.726807",\
              "550.233337, 549.166687, 547.612549, 543.989136, 528.204468",\
              "552.729919, 551.663269, 550.109131, 546.485718, 530.701050",\
              "559.077820, 558.011169, 556.457031, 552.833618, 537.048930",\
              "570.500671, 569.434021, 567.879883, 564.256470, 548.471802");
    }
  }
  fall_constraint(f_dtrans_ctrans){
    index_1 ( "0.000000, 3.088950, 7.836690, 19.881800, 50.000000");
    index_2 ( "0.000000, 2.422370, 5.442220, 12.226800, 50.000000");
    values( "573.159424, 572.092773, 570.538635, 566.915161, 551.130615",\
            "574.540405, 573.473755, 571.919617, 568.296143, 552.511597",\
            "576.859375, 575.792725, 574.238586, 570.615112, 554.830566",\
            "582.465942, 581.399292, 579.845154, 576.221680, 560.437134",\
            "591.395264, 590.328613, 588.774475, 585.151001, 569.366455");
  }
} /* end of arc TCK_TDI_stnr */
```

Fig. 8: Timing arcs on TDI pin with annotation delay

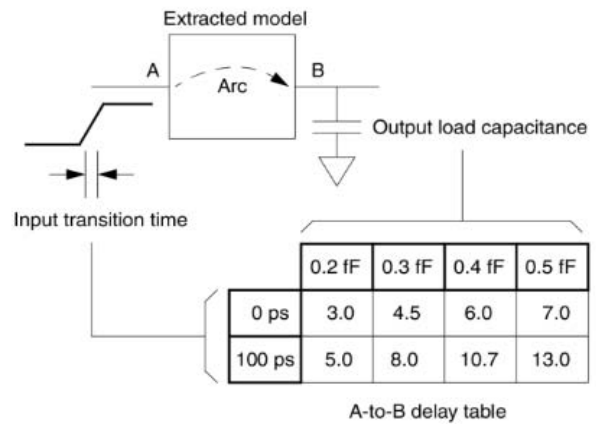


Fig. 9: Delay calculation from the generated ETM timing arcs

The delay of the cell or macro is calculated by considering the input transition time and output load capacitance which is specified in the generated ETM library. Index 1 indicates the input transition time and index 2 indicates the output capacitance. And these values can be adjusted to meet the timing budget at SOC level.

V. CONCLUSION

The timing analysis solutions in use today have been extended to more complex circuit analysis and variation. ETM (Extracted timing models) with necessary time-budgeting instead of IP Netlists reduces run-time and memory usage and protects the IP. By considering the annotation delays the generated library is more relevant to the real time environment. The timing models in hierarchical analysis saves the runtime. And by using process monitor the gate is 2ps is measured, which is an accurate process to measure the delay of the gate.

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“iNav”-Indoor Positioning and Navigation System

By S. L. Wickramarachchi, W. O. N. Fernando, M. H. Dulaj Dilrukshan Appuhamy,
B. Gowtham & Jeewan Chinthika

Abstract- Getting a pin-point accurate location is a difficult task and prone to many errors, thus providing a wrong location. Existing GPS Based Location service has proved to be moderately reliable, but it is not the same when considering indoor wise location. Getting an indoor location inside a building is harder than ever since due the signal barriers and narrow range. In this article a system for Indoor Positioning and Navigating with customized maps is presented. This will make the users to get to know the location very quickly and easily. It will be more applicable for the Government Departments where it is difficult to find a proper location. The RSSI of the wireless access points will be used to triangulate the location.

Keywords: location, indoor positioning, access points, WIFI adapters, floor plan.

GJCST-A Classification: H.5.4



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"iNav"-Indoor Positioning and Navigation System

S. L. Wickramarachchi^α, W. O. N. Fernando^σ, M. H. Dulaj Dilrukshan Appuhamy^ρ, B. Gowtham^ω & Jeewan Chinthika[¥]

Abstract- Getting a pin-point accurate location is a difficult task and prone to many errors, thus providing a wrong location. Existing GPS Based Location service has proved to be moderately reliable, but it is not the same when considering indoor wise location. Getting an indoor location inside a building is harder than ever since due the signal barriers and narrow range. In this article a system for Indoor Positioning and Navigating with customized maps is presented. This will make the users to get to know the location very quickly and easily. It will be more applicable for the Government Departments where it is difficult to find a proper location. The RSSI of the wireless access points will be used to triangulate the location.

Keywords: location, indoor positioning, access points, WIFI adapters, floor plan.

I. INTRODUCTION

Finding a specific location inside of a large building is a tedious and time-wasting task to a person who has never been to the place before. The iNav will help the users to find the way in, way out and other sections or shops if it is a Shopping Complex, Government Departments and Institutions etc.... For an example if a person goes to Department of Immigration and Emigration of Sri Lanka to apply for a passport he/she will have to go from place to place spending all his time searching for the specific places he needs to go. If there is a way of getting indoor location that will ease his work and get the work done quickly.

Most of the people are having Smart Phones which comes with Android Operating System. The application is built to run on an android device. The location is being determined by using the Received Signal Strength Indicator (RSSI) of the wireless access points residing in the building.

Objectives of this research are follows,

- i. To develop an algorithm to determine exact position of the device/user will be identified using a trilateration that uses the RSS of Wi-Fi access points.
- ii. To develop an algorithm to draw the path to the intended destination from the current location or from a specific location as required.
- iii. To develop an android application to determine the current location and provide voice navigation. This research has been organized as follows.

Section 2 has provided the background through the Literature Review. Section 3 describes the Methodology of this System. The discussion of the developed system has described in Section 4. Section 5 contains results and discussion of this research. Finally, Conclusion is discussed in Section 6.

II. LITERATURE REVIEW

With the technological advancements the need to use positioning systems is ever increasing. The most reliable and widely used positioning system is GPS (Global Positioning System). Even though it remains as the best suited method to Outdoor positioning, when it comes to Indoor positioning it lacks the accuracy due to its inability pass through the building materials. Therefore, throughout the years the researches are trying devise new means for indoor positioning which are both accurate and cost effective. Below are the Research works carried out for Indoor Positioning System.

Researches based on Indoor positioning using Visual Light Communication (VLC) has been an interesting field due to the accuracy of its positioning, license-free operation etc. There are several indoor positioning methods based on VLC like triangulation base on Received Signal Strength (RSS), fingerprint analysis, proximity and image positioning methods.

Bangjiang Lin and his team have proposed system for indoor positioning using Orthogonal Frequency Division Multiplexing Access (OFDMA) scheme. In the system they have proposed, they used three subcarriers with the maximum received signal intensity using three LEDs without the Inter Carrier Interference to locate the receiver's position. [1]

A team lead by Silke Feldmann has proposed Bluetooth-based positioning system which uses the Radio Signal Strength Indicator (RSSI) to measure the distance between the sender and the receiver. They have used Least Square Estimation (LSE) to determine the approximate RSSI value and have devised a method to convert the RSSI value to a distance. Then using the triangulation method, which uses 3 or more signal emitters, to locate the device. [3]

The area of Wi-Fi based positioning service has caught attention of many researchers. Main reason behind this is that the Wi-Fi is already available in almost every place including public areas and supported by

many devices. Since the ability to use existing Wi-Fi access points to determine the position, the cost it takes to establish the system is low.

The system proposed by Qiyue Li and his team uses Received Signal Strength (RSS) and Radio Frequency Fingerprinting in order to determine the position of a device. First the system gets the RSS data from neighboring Access Points (3 or more) to get an approximate location. Then through the collaboration between the location derived from the RSS and the fingerprint map, the system provides the user with an accurate location of the device. [4]

When it comes to using wireless local positioning systems, the main drawback faced was the path loss. Where the wireless signal accuracy drops due to various obstacles in the transmission path like concrete structures, brick structures and other various materials which reflect or refract the wireless signal.

R. F. Safna and her team have studied the previous Wireless pathloss models and developed a new optimized Wireless pathloss model to determining the placement of the Access Points. They have identified four factors which plays a major role in indoor coverage footprint. They are shadowing, wall attenuation factor, floor attenuation factor and the employed frequency band. The team have selected JTC (Joint technical committee) indoor path loss model as the base model to the optimization of wireless access point placement. [5]

The quality of wireless signal can be varied due to the hardware facts such as transmission power, frequency, temperature and humidity. To test these theories various researches have been done.

A team lead by Kenneth Bannister studied the effects of temperature on wireless signal strength. They have used two sensor nodes for this experiment and have connected them using a coaxial cable and a sequence of attenuators with nominal value of 60dB to reduce noise and signal variability. The tests were performed by using one as a control node and putting the other inside a chamber where you can change the temperature. After the experiment they have concluded that temperature has a negative effect on Signal Strength and that when the temperature increases the Signal Strength decreases linearly up to 8dB at 65°C. [6]

Dolphin system consist of distributed wireless sensor nodes which are capable of sending and receiving RF and ultrasonic signals. These nodes are attached to various indoor objects. In this system, all objects in the system have capability of sending and receiving ultrasonic and radio signals to measure distance between two objects with only a few manually preconfigured objects as reference stations. All other locations of objects are gradually determined based on a recursive positioning algorithm. The RF function is used for time synchronization and message exchange

among nodes. There are two main advantages in this mechanism. First, the system requires only a few (minimum three) nodes to determine all position of nodes. Second, nodes can determine their position even if the nodes cannot receive ultrasound from reference nodes directly. In the DOLPHIN system, there are two types of nodes: a reference node, which is a fixed node located to previously measured position, and a normal node which location is determined by the algorithm. Each node has a unique ID for RF communication, a node list for node selection, and a position table for position calculation. [7]

The below Table 1 shows list of similar research products/research areas referred in understand the availability of similar systems.

Table 1: Existing Systems

| Existing Systems | Fingerprinting | Positioning using RSS | Trilateration Technique |
|--|----------------|-----------------------|-------------------------|
| 1. Angle of Arrival Estimation using Wi-Fi and Smartphones | No | No | No |
| 2. Indoor Wi-Fi Localization on mobile devices | Yes | Yes | Yes |
| 3. Quuppa's HAIP system | No | No | No |
| 4. Apple's Wi-FiSLAM | Yes | Yes | Yes |
| 5. Wi-Fi Compass for Indoor Passive Positioning with Decimeter Accuracy | No | No | Yes |
| 6. RSS-Based Indoor Positioning Based on Multi-Dimensional Kernel Modeling and Weighted Average Tracking | Yes | Yes | No |
| Our System (INPS) | No | Yes | Yes |

III. METHODOLOGY

The development of the iNavhas be done based on the Prototype methodology. Prototype is a working model of software with some limited functionality. The prototype does not always hold the exact logic used in the actual software application and is an extra effort to be considered under effort estimation.

a) Planning

This is the initial phase of the SDLC which determines the feasibility of the project. It involves creating of a set of plans to help guide your team through the execution and closure phases of the project.

In our Project we have gathered the required information from the User how the System should work, and we planned accordingly. GPS will not be accurate inside location and we found an alternative solution to

use inside of a building. WIFI will be used to get the position of the user.

b) Analysis

A research has been carried out to study about the factors related to indoor positioning system in various buildings. Population for this data gathering is Customers. Questionnaire has been taken as Data gathering method. Questionnaire were carried out to the sample size of 50 people based on non-probability sampling.

Based on the data gathered for this project below have been found out.

- Age Group between 20-25 requires this System to get implemented in large building as it will make their visit easier.
- Most of the people are getting the help from the people who are working at the buildings to get navigation direction.
- People like to have a way of navigating them to the shops easily in this Application.

Based on the data gathering we have decided to add following functions in our project.

- Voice Navigation
- Rate Shops
- Locate a friend

c) Design

This phase will explain how the system will operate with the relevant Hardware and Software using diagrams. This will include High Level Architecture Diagram, Use Case and Class Diagram. The System is designed and finalized in this phase with all the requirements. High Level Diagram for this System is shown below.

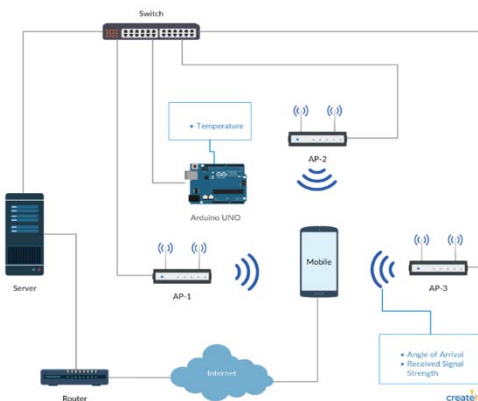


Figure 1: High Level Architecture Diagram

The RSS is measured from the mobile device and will be send to the local server through the use of mobile data with its WiFi adapter's MAC address and a time stamp. This combine with the data from the humidity and the temperature sensors will be sent to the local server with the MAC address of the mobile device. Then the server will determine the position of the mobile device and send it to the device via internet.

d) Implementation

Android Studio will be used for development of the Application. Android SDK version 27 will be used. Java will also be used for the coding purpose instead of using Kotlin. We will be using Amazon Web Services to get the data from the Database for Positioning. Access Points will be used to find the location of the user and Arduino will be used to calculate the temperature and humidity.

e) Testing

This phase focus on identifying the system defects and fixing them to provide the system with a better quality, performance and accuracy. Performing tests during the early steps of SDLC reduces risks. Testing that to be performed is discussed below.

IV. RESULTS AND DISCUSSIONS

a) Login Screen

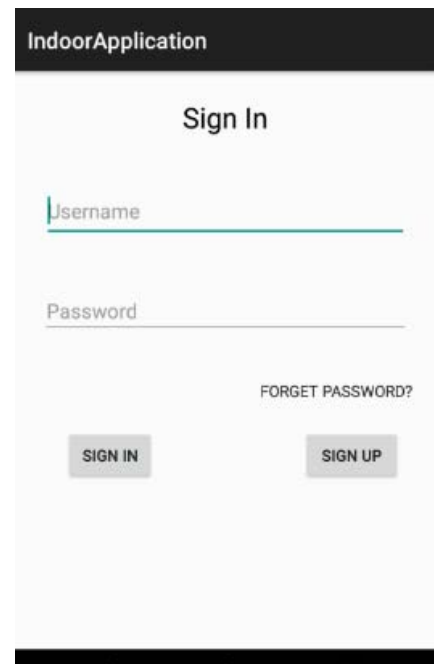
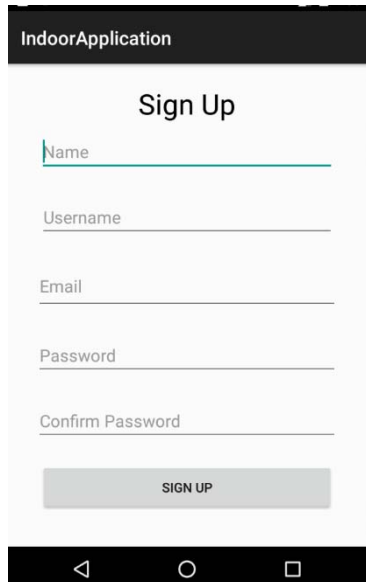


Figure 2: Login Interface

Login interface for the android user. User will have to enter Username and Password which they used to register.

b) Sign Up



The Sign Up interface is a mobile application screen titled "IndoorApplication" with a "Sign Up" header. It contains five input fields: "Name", "Username", "Email", "Password", and "Confirm Password". Below these fields is a grey "SIGN UP" button. The screen is framed by an Android-style navigation bar at the bottom.

Figure 2: Sign up Interface

User registration interface for android user. User needs to enter Name, Username which will be used to login to the application then email address and password.

c) Home Screen

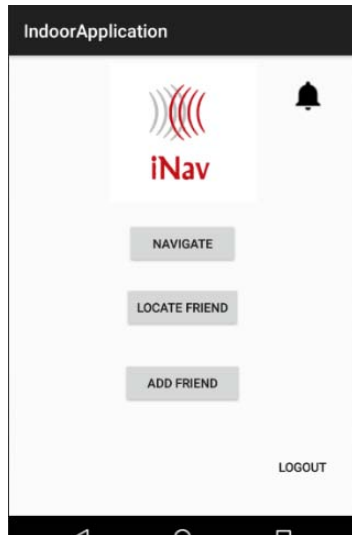


Figure 3: Home Interface

User will be greeted with the Home interface when they login. Application provide options to the user to select such as Navigate, locate Friend or Add a friend.

d) Navigate Screen



Figure 4: Navigate Screen

If the user selects the navigate option from the Home interface, user will be taken to the navigate interface in which the user can select from which room to room to navigate.

e) Locate Friend



Figure 5: Locate Friend Interface

When user selects the Locate friend option from the home interface, user will be taken to locate friend interface. User can locate whoever in the specific floor if the friend is online in the system and that friend is added to the list. By entering the name of the friend, he/she will be located in the floor map.

f) Shop Rate

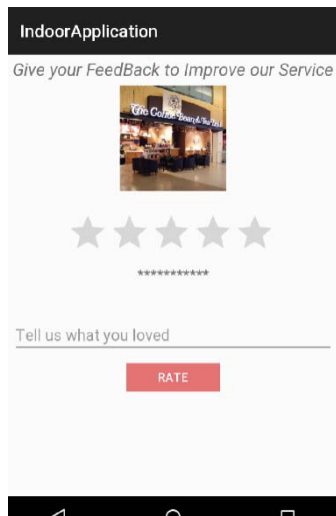


Figure 6: Shop Rate Interface

Shops which are in the specific floor will be able to rate by the user and add reviews to them.

V. DISCUSSION

"iNav" allows the user to locate themselves in a particular building with high accuracy, then using that information they can get the navigation path to a desired location in the building. The application also allows the user to locate other users from the friend list within the same building. Additionally, "iNav" also allows its users to view ratings of the shops inside the building, read reviews and give them as well. The system will be accessible at any given time therefore the users can use its functions anytime they desire.

The major challenges faced by research and development team during the development period are listed below

- Build or adjusting algorithms to achieve accurate results
- Learning new technologies
- Retrieving answers from logical questions.

The system was originally planned to include a build owner interface, where it allows the building owners to add the blueprints of their buildings and get the locations to place the Access Points in the most feasible and accurate way. But the time constraints of the project, amount of research involved in the topic and lack of knowledge in the field led the team to remove this interface completely.

And originally the location was to be derived from three methods Received Signal Strength measurements (RSS). Because of the different processing capabilities of the end devices, it causes the application to have different reaction times in different end devices which cannot be generalized into a constant value or set of values. Due to this reason the

team decided to devoid from using this method completely.

VI. CONCLUSION

iNavhas been developed with the main objective to give current position of the users and navigation to their desired Destination inside the same floor inside the building. This system will help them to locate where they are and where their friends are inside the same floor. Using Username of their friends or Mobile Numbers, friend can be located if he is in the same floor. Shop Ratings will be developed to get reviews from the users for the shops which is in the same floor. This will enable for a user to view the Reviews of a shop before visiting them. Voice Navigation will also be developed for the navigation purpose. User can give Start Location and End Location, once those are given user can select Voice Navigation to navigate them using Voice. Paths will be drawn from the place where user is. An Android Application will be developed using Java with compatible for Android Version 5.1(KitKat) or above. And it can be downloaded from Play Store for free of charge.

VII. LIMITATION

The main intention of developing this system is to introduce a Positioning and Navigation System is to provide solution to customers visiting large building from loitering here and there. This mobile application is currently focusing on one floor for the navigation and positioning. If the number of simultaneous users get increased the signal strength that the end devices receive will be reduced, which in turn can lead to possible decrease in accuracy. And if the user is having an android mobile which is lesser than the required Android Version it will not be supported. User should also be able to connect to internet using their Mobile Data. For that they should be having enough data in their mobile. If they don't have enough data in their mobile to get connected our servers, they will not be able to use our application. Application will not work on the users' mobile if their mobiles are having any problems related to WIFI signals.

VIII. FUTURE WORK

The recommendations for any parties who are interested in developing this system further are,

- The research group should make their users to access the Application in anywhere in the building. All the locations should be defined for the relevant building floors.
- Make the Application compatible with iOS.
- Make the Application which will be supporting to newer versions of the AndroidOS.

- Make the application run with a variety of language options.
- Adding Time of Flight to increase the accuracy of the positioning service.
- Add means to get building blueprints from the user and give the locations to place the Access Point.
- Add Augmented Reality to the Application so user can have a different view of the map and easy to view the paths to their destination.

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Prevalence of Bovine Fasciolosis and its Economic Significance at Robe Municipal Abattoir

By Muzeyen Mohammadnur & Mamo Geleta

Abstract- A cross-sectional study was conducted to determine the abattoir prevalence of bovine fasciolosis and its economic importance in Robe Municipal Abattoir. A total of 502 cattle were randomly sampled and examined after slaughter. Out of 502 cattle examined at post mortem, 68.72% (345) were positive for fasciolosis. The prevalence of bovine fasciolosis was found to be significantly affected ($P < 0.05$) by the age of animal, in which young animals were affected than adult animals. The prevalence of bovine fasciolosis was also higher ($P < 0.05$) in poor body conditioned animals than good body conditioned animals. Sex of the animal was not found as a significant factor ($p > 0.05$) affecting the prevalence of disease. The prevalence of *Fasciola hepatica* was 238(68.98%) which was predominant among *Fasciola* species, causing bovine fasciolosis in the study areas. Whereas, the prevalence of *Fasciola gigantica* was 107 (31.02%). The economic significance of bovine fasciolosis was also assessed based on condemned livers. Thus, based on retail value of bovine liver, the direct economic loss from fasciolosis during the study time was estimated to be 164,880 ETBannually.

Keywords: robe; bovine; economic significant; fasciola; prevalence.

GJCST-A Classification: J.4



Strictly as per the compliance and regulations of:



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I. INTRODUCTION

Fasciolosis is a liver parasitic infection affecting mainly both domestic and wild ruminants, but monogastrics and even humans can be infected (Knubben-Schweizer 2010; Mas-Coma *et al.* 1999; Qureshi *et al.* 2005). The two most important species that cause fasciolosis are *Fasciola hepatica* and *Fasciola gigantica* (Mungube *et al.* 2006; Rapsch *et al.* 2006; Terefe *et al.* 2012; Tolosa and Tigre 2007). These species are the causative agents of fasciolosis of animals and human, are reported from different regions in Iran (Ashrafi *et al.* 2006; Moghaddam *et al.* 2004; Rokni *et al.* 2002). It is a serious disease of herbivorous animals (Torgerson and Claxton, 1999), leading to huge economic losses in livestock production, while human infection has long been seemed to be accidentally (Mas-Coma *et al.*, 2005). The distribution of *Fasciola hepatica* is limited to temperate areas and high land of tropical and sub-tropical regions while *Fasciola gigantica* is wide spread in most parts of tropical Africa. Thus, the distribution of two *Fasciola* species overlap in many African and Asian countries and sometimes in the

same country, although in such cases the ecological requirements of the flukes and their snail intermediate host is distinct (Mas-Coma *et al.*, 2005; Walker *et al.*, 2008). The geographic distribution of *Fasciola* species is dependent on the distribution of suitable species of snails such as *Lymnae natalensis* and *Lymnae truncatula*, the most common intermediate hosts and usually associated with herds and flocks grazing wet marshy land area. Both *Lymnae* species are needed for the parasite's life cycle to be completed. According to Thomas (1883) and Brown (2005), the distribution of fasciolosis is associated with the favorable climatic and ecological conditions for development, spread and maturity of parasite and its lifecycle stages in various areas. In view of the worldwide spread, occurrence and zoonotic nature, fasciolosis has emerged as a major global and regional concern affecting all domestic animals and infection is most prevalent in regions with intensive cattle production (WHO, 2008). From the many parasitic problems of farm domestic animals, fasciolosis is the most important disease, which causes direct and indirect economic loss on livestock production, particularly of sheep and cattle (Keyyu *et al.*, 2006). The disease is the major cause for the considerable economic losses in the cattle industry, mainly through mortality, liver condemnation, reduced production of milk, meat and expenditures for anthelmintics (Hillyer and Apt, 1997). Therefore, the objectives of this study were to assess the current on farm and abattoir prevalence of bovine fasciolosis and associated economic loss at robe municipal abattoir.

II. MATERIALS AND METHODS

a) Study Area

The current study was conducted at robe municipal abattoir, from December 2016 to January 2017. Robe town is found in south eastern of oromia about 430 km from Addis Ababa, capital city of Ethiopia. Robe is located at 7°7'N latitude and 40°0'E longitudes and its altitude 2,492 meter (8,176) above sea level. The rainy season of the area is from April to September and the annual minimum and maximum temperature is 15°C and 25°C, respectively. Prevailing agricultural system is the main occupation of the area with integrated annual crop and livestock production in which oxen provides the power for ploughing smallholder's fields.

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b) Study Animals and Study Design

The study animals were cattle brought to the abattoir for slaughter from different localities around Robe town. A cross sectional active abattoir survey was conducted from December 2016 to January 2017 to assess the prevalence of Bovine fasciolosis and its economic losses at Robe abattoir, south eastern oromia.

c) Sample Size and Sampling Technique

The required minimum sample size was estimated using formula described by Daniel (1995) as follows: $n = z^2 pexp (1-pexp)/d^2$ Where, n = required sample size; z = standard value; $pexp$ = expected prevalence of bovine fasciolosis in the study area; d = desired absolute.

During ante-mortem examination, each of study animals were marked by color marker and their age, sex and body condition scoring was recorded. The age of the animals was determined according to their dentitions as described by Kelly (1975) and two age groups were considered as below and above five years. Body condition scoring was done according to Nicholson and Butter Worth (1986) and classified in to two categories; medium and good. During postmortem examination, liver and related bile ducts were carefully inspected by visual inspection, palpation and systematic incision for the presence of fasciola species (Getaw *et al.*, 2010). The Fasciola species were identified by their morphological features according to Urguhart *et al.*, (1996).

Assessment of direct economic losses due to liver condemnation was estimated based on annual slaughtered capacity of the abattoir, average market price of liver in the study area and rejection rate of liver or prevalence of the disease. The Annual slaughtered rate of the abattoir was estimated from retrospective abattoir record of the last years and average market price of liver was determined by interviewing personnel of the abattoir and butchers. The annual economic loss due to liver condemnation was estimated by the formula set by Ogunrinade and Ogunrinade(1980) as follows:

$$ACW = CSR \times CL \times BC \times P \times 126 \text{ Kg.}$$

Where ACW = Annual loss from carcass weight reduction.

CSR = Average No cattle slaughtered per annual at the study abattoir.

CL= Carcass weight loss in individual cattle fasciolosis.
BC = An average price of 1kg beef at Robe town,
P=Prevalence rate of fasciolosis at the study abattoir.
126 kg = Average carcass weight of Ethiopian Zebu.

d) Statistical Analysis

Collected data were entered in to Microsoft excel and analyzed by SPSS version 16. Prevalence of bovine fasciolosis was calculated as the number of positive cattle divided by the total number of cattle

examined. Chi square test was used to evaluate the association between bovine fasciolosis and host related factors like sex, age and body conditions. P - Value less than 0.05 was considered as statistical significant.

III. RESULTS

A total of 502 indigenous cattle breeds that were slaughtered at Robe municipal abattoir were examined for the presence of fasciolosis. Among the examined animals, 345(68.72%) were positive for fasciolosis. Out of 345 livers positive for fasciolosis, 238 livers (68.98%) harbored *F. hepatica* and 107(31.02%) harbored *F. gigantica* as shown by Table 1 and 4. The highest (75.38%) prevalence was in young animals and the lowest (46.55%) was found in adult animals. Among eight different origins, no significant difference ($p > 0.05$) in the prevalence of bovine fasciolosis was observed. However, the prevalence of fasciolosis was highest (75.5%) in Alemgena area and the lowest (37.5%) prevalence was observed in Dinsho. There was a significant difference ($p < 0.05$) in the prevalence of bovine fasciolosis within different body conditions. The highest prevalence (70.37%) was found in animals with poor body condition and the lowest prevalence was found in good body conditioned animals (table 3). Among 502 cattle examined at Robe municipal abattoir, 487 were male, from these, 332(68.17%) were positive for fasciolosis and 15 of them were females which showed 13(86.67%) prevalence of fasciolosis(table 2).

Table 1: Prevalence of Bovine Fasciolosis by Age.

| Age | Total animal examined | Prevalence |
|-------|-----------------------|-------------|
| Young | 386 | 291(75.38%) |
| Adult | 116 | 54(46.55%) |
| Total | 502 | 345(68.72%) |

Table 2: Prevalence of Bovine Fasciolosis by Sex.

| Sex | Total Animal Examined | Prevalence |
|--------|-----------------------|-------------|
| Male | 487 | 332(68.17%) |
| Female | 15 | 13(86.67%) |
| Total | 502 | 345(31.27%) |

Table 3: Prevalence of bovine fasciolosis by body condition.

| Body condition | Total animal examined | Prevalence |
|----------------|-----------------------|-------------|
| Poor | 54 | 38(70.37%) |
| Good | 448 | 307(68.52%) |
| Total | 502 | 345(68.72%) |

Table 4: Species of *Fasciola* identified during post mortem examination of slaughtered animals.

| Species of <i>Fasciola</i> | No. of Liver Condemned | Percentage (%) |
|----------------------------|------------------------|----------------|
| F.Hepatica | 238 | 68.98 |
| F.Gigantica | 107 | 31.02 |
| Total | 345 | 100.00 |

Table 5: Prevalence of bovine fasciolosis by origin.

| Origin | No. of animal examined | Prevalence |
|----------|------------------------|-------------|
| Agarfa | 30 | 17(56.67%) |
| Alemgena | 41 | 31(75.5%) |
| Ali | 180 | 132(73.33%) |
| Dinsho | 8 | 3(37.5%) |
| Gasara | 32 | 22(68.75%) |
| Goba | 31 | 22(60.97%) |
| Hisu | 101 | 59(58.4%) |
| Robe | 79 | 54(68.35%) |
| Total | 502 | 345(68.73%) |

Table 6: Percentage of degree of pathological lesion of infected liver

| Degree of pathological lesion | No. of liver infected | Percentage (%) |
|-------------------------------|-----------------------|----------------|
| Light(L) | 57 | 16.52 |
| Medium(M) | 111 | 32.17 |
| Severe(S) | 177 | 51.30 |
| Total | 345 | 100.00 |

a) Economic Loss Assessments**Direct Economic loss**

Direct economic loss was resulted from liver condemnation as the result of fasciolosis. Generally all infected livers with fasciolosis are unfit for human consumption. The 345 fasciolosis infected livers of cattle were corresponding to an estimated total loss of about 14,225.04 ETB. In the study abattoir the average annual cattle slaughtered rate was estimated to be 3000 while mean retail price of bovine liver in Robe town as 60 ETB. Prevalence of fasciolosis in Robe municipality abattoir estimated as (68.72%). Therefore the estimated annual loss form organ condemnation is calculated according to the formula:

$$ALC = CSR \times LC \times P = 4000 \times 60 \text{ ETB} \times 68.72\% = 4000 \times 60 \text{ ETB} \times 0.687 = 164,880 \text{ ETB}$$

b) Indirect Economic loss

Indirect economic loss was due to carcass weight reduction as result of *Fasciola* infection. In the study area the average price of 1kg beef was 80 ETB. The annual economic loss from carcass weight reduction due to bovine fasciolosis is calculated by using the formula:

$$ACW = CSR \times CL \times BC \times P \times 126\text{kg} = 4000 \times 10\% \times 80 \text{ ETB} \times 68.72\% \times 126\text{kg}$$

$$= 4000 \times 0.1 \times 80 \text{ ETB} \times 0.6872 \times 126\text{kg} = 2,770,790.4 \text{ ETB}$$

Therefore, the total annual economic loss due to bovine fasciolosis in the study abattoir is the summation of the losses from organ condemnation (direct loss) and carcass weight reduction (indirect loss) and thus a total of 2,935,670.4 ETB (108,728.5 USD).

NB: 1 USD was equivalent to 27.00 ETB.

IV. DISCUSSIONS

The present study revealed that overall prevalence of fasciolosis in the study area is 68.73%. Different findings on prevalence of fasciolosis have been reported from different parts of Ethiopia. Out of the studies carried, much higher prevalence of fasciolosis was reported from Gonder, Wondogenet, Jimma, Adwa and Hawassa municipality abattoirs (Yilma and Mesfin, 2000; Tilahun *et al.*, 2006; Tolosa and Tigre, 2007; Bekele *et al.*, 2010 and Rahmeto *et al.*, 2010).

Availability of moisture, optimal temperature and suitable snail habitat are among factors influence the occurrence of fasciolosis in a certain area (Urquhart *et al.*, 1996). An optimal temperature of 10 °C and 16°C are necessary for snail vectors of *F. hepatica* and *F. gigantica* and for development of the *Fasciola* in the intermediate snail hosts. Moreover, such conditions are required for completion of the life cycle such as development of fluke eggs, miracidia searching for snails and dispersal of cercaria (Urquhart *et al.*, 1996). Variation of these environmental and ecological factors on different agro ecological zones leads to variation of the prevalence of fasciolosis from one study area to other localities.

Post mortem examination on the 502 *Fasciola* infected livers of current results indicated that the prevalence of *F. hepatica* (68.98%) was higher than that of *F. gigantica* (31.02 %). The high prevalence of *F. hepatica* may be associated with the presence of favorable ecological biotypes for its snail vector *Lymnaea truncatula*.

The abattoir prevalence of the parasites in adult and young for *fasciola* was 54(46.55%) and 291(75.38%). This finding was higher than that of the study conducted by Abebe *et al.* (2011) with the prevalence of 30.04% and 35.97% in adult and young animals respectively. Even though such variation of the prevalence was exist it is not statistically significant ($P > 0.05$).

The prevalence of the parasites in the different body condition of the animals was also determined and its prevalence for both *F. hepatica* and *F. gigantica* in poor body condition was 38(70.37%) but in that of good body condition animals it was 307(68.52%). The current finding was higher for both *F. hepatica* and *F. gigantica* in animals having poor body condition 23.1% and 11.9% Mihreteab *et al.* (2010). This might be due to the fact

that animals with poor body condition are usually less resistant and are consequently susceptible to infectious diseases. Even though, the prevalence in the different body condition of the animals was varied it was not statistically significant ($P > 0.05$).

The total annual economic losses encountered due to condemnation of infected liver in Robe town were calculated as 164,880 ETB (\$6,106.7). The present finding is by far lower than the results reported by Daniel (1995) who reported a total economic loss of 215,000 ETB (\$2,891,025 and \$4,031.250) annually in cattle due to fasciolosis at Dire Dawa municipal abattoir. These higher values may be due to higher number of animals slaughtered at the Dire Dawa abattoirs. The ecological conditions and the number of intermediate host found around the area may also be another factor contributing to the decrement of the economic loss.

V. CONCLUSIONS

The present study revealed that although a moderate prevalence of bovine fasciolosis in the study sites recorded; the prevalence was significantly affected by sex, age and body condition of the animal. Higher prevalence of bovine fasciolosis was recorded in females cattle than males and in younger cattle (> 3 yrs) than older (> 5 yrs) ones. *F. hepatica* was found to be the predominant fasciola species causing bovine fasciolosis in the study. Finally the total annual economic losses due to bovine fasciolosis in the study abattoir from organ condemnation (direct loss) and carcass weight reduction (indirect loss) were high.

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- i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
- j) There should be brief acknowledgments.
- k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

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



FORMAT STRUCTURE

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

All manuscripts submitted to Global Journals should include:

Title

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

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

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning 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 a research paper?" Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.



Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

PREPARATION OF ELETRONIC FIGURES FOR PUBLICATION

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form before your paper can be published. Also, you can email your editor to remove the color fee after acceptance of the paper.

TIPS FOR WRITING A GOOD QUALITY COMPUTER SCIENCE RESEARCH PAPER

Techniques for writing a good quality computer science research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of computer science then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.



6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

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

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. 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 for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

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

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

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

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.



20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon 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 through which your research is going to be in print for 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 of 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 criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to 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 progression.

General style:

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 avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

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

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite 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 approaches 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. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a 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 limit the initial two items to no more than one line each.

Reason for writing the article—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 for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity 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 of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.



The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets 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 for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory 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 soundly written procedures segment allows a capable scientist to replicate 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 to give the least amount of information that would permit another capable scientist to replicate 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 section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show 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:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the 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—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and 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 as 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. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give 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 manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit 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 section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an 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 implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully 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 the prospect, and let it drop at that. Make a decision as to whether each premise is supported or 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 an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of 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 other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

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BY GLOBAL JOURNALS INC. (US)

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| Topics | Grades | | |
|-------------------------------|--|---|--|
| | 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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