UNIVERSITI TEKNOLOGI MALAYSIA | Razak Faculty of Technology and Informatics

POST MODULE ASSIGNMENT
SEMESTER II – 2022 / 2023 SESSION 2

COURSE CODE	:	MRSF 1233
COURSE NAME	:	ENGINEERING DESIGN PROCESS & METHODOLOGY
PROGRAMME	:	MASTER OF SCIENCE (ENGINEERING DESIGN)
DURATION	:	4 WEEKS AFTER THE CLASS
DATE	:	

INSTRUCTION TO CANDIDATES :

ANSWER **ALL** QUESTIONS IN THE ANSWER BOOKLET

(You are required to write your name and your lecturer's name on your answer script)

NAME	:	……..……
I.C NO./PASSPORT NO.	:	……..……
YEAR / COURSE	:	……..……..…….
STUDENT'S SECTION	:	……..……..…….
LECTURER'S NAME	:	……..……

This PMA question consists of ( ) printed pages only

POST MODULE ASSESSMENT (40%)
MRSF 1233 ENGINEERING DESIGN PROCESS & METHODOLOGY
RAZAK FACULTY OF TECHNOLOGY AND INFORMATICS

Design, Analyses and Fabricate of Pneumatic Target Drone Launcher

The pneumatic launcher system is designed to launch unmanned aerial vehicles with a maximum take-off weight of up to 120 kg at a speed of 30 m/s. At the same time, the launch speed of lighter UAVs can be higher, up to 40 m/s. The pneumatic launcher is capable of launching UAVs in a variety of weather conditions and in the temperature range from -5 ° to +50 ° C. We offer full training courses in operating pneumatic launchers for all clients.

Target Drone Launcher

Technical Specification	
Length	11000mm
Take-off Weight	120kg
take-off Speed	30m/s (12 bar powered model)
Max. Of Acceleration	≤10g
Launch Angle	0° ~ 25°
Setup Time Ready For Launch	≤5min
Recovery Time	≤5min
Operation Temperature	5℃ ~ +50℃
Launcher Weight	1050kg
Additional Air Tank Weight	38kg

Case study of Target Drone Launcher

From the case study you need to write a technical paper with the criteria including literature review, research method, analyse, discussion and conclusion.

(CLO1, CLO2, CLO3 – 40%)

PMA requirement

- Pages number: minimum 10 pages (not including references and appendix)
- Needs to be supported with citations from journals and any related documents
- Please use the PMA template provided on page 5
- Please submit PMA hard copy and softcopy before 4 July 2023. Please email softcopy to shamsuls.kl@utm.my and fadhilah.abdulrazak@utm.my.

The following format should be followed for a design report. The completed report should be bound with a cover.

Abstract/Executive Summary:
a) The purpose of the Abstract/Executive Summary is to provide key information up-front, such that while reading the report, a reader has expectations that are fulfilled on a continuous basis.
Key to a good Summary is the first sentence, which must contain the most essential information that you wish to convey.
b) The summary is to be written as if the reader is totally uninformed about your project and is not necessarily going to read the report itself.
c) It must include a short description of the project, the process and the results.
d) The Executive Summary is to be one page or less with one figure maximum.

Introduction: Include background and Literature Review.

Design problem and objectives: Give a clear and concise definition of the problem and the intended objectives. Outline the design constraints and cost implications.
a) Include appropriate background on the project for the reader to be able to put the information provided in context.
b) The final project objectives must also be presented in the form of a set of technical specifications.

Detailed design documentation: Show all elements of your design including an explanation of
a) Assumptions made, making sure to justify your design decisions.
b) Function of the System
c) Ability of meet Engineering Specifications
d) Prototypes developed, their testing and results relative to Engineering Specifications
e) Cost analysis

f) Manufacturing processes used
g) DFX results
h) Human factors considered
i) All diagrams, figures and tables should be accurately and clearly labelled with meaningful names and/or titles. When there are numerous pages of computer-generated data, it is preferable to put this information in an appendix with an explanation in the report narrative.

Laboratory test plans and results for all portions of the system that you built and tested. Used tables, graphs, and wherever possible to show your results. Also, include a description of how you plan to test the final system, and any features you will include in the design to facilitate this testing. This section forms the written record of the performance of your design against specifications.

Bill of materials: Parts costs include only those items included in the final design. A detailed bill of materials includes (if possible) manufacturer, part number, part description, supplier, quantity, and cost.

Gantt chart: Show a complete listing of the major tasks to be performed, a time schedule for completing them, and which team member has the primary responsibility (and who will be held accountable) for each task.

Ethical Consideration: Provide information on any ethical considerations that govern the product specifications you have developed or that need to be taken into account in potentially marketing the product.

Safety: Provide a statement of the safety consideration in your proposed design to the extent that is relevant.

Conclusions: Provide a reasoned listing of only the most significant results

Acknowledgments: List individuals and/or companies that provided support in the way of equipment, advice, money, samples, etc.

References: Including books, technical journals, and patents.

Appendices: As needed for the following types of information:
a) Detailed computations and computer generated data.
b) Manufacturers' specifications.
c) Original laboratory data.

All PMA will go through “TURNITIN” to screen the Overall Similarity Index. The accepted similarity index should not be more than 20%

End of Post Module Assignment

PMA Template

Real-time with Load Distributed Routing Protocol in Wireless Sensor Networks

Ahmad Shahrin Ramli, Siti Zulfarina Fadzli, and Hassan Ali

ABSTRACT

1.1 INTRODUCTION

The Wireless Sensor Network (WSN) is a wireless ad hoc network that consists of a very large number of sensor nodes which are densely deployed either inside an event area or in close proximity as shown in Figure 1.1. The advantage of using the WSN is that enables reliable monitoring and carries out an analysis of the physical environment. It is very different from the traditional networks as it comprises a large number of nodes that produces a very large amount of data. However, WSNs are not free of constraints which are related to power, computational capacities, and memory. Due to these inherent properties, conventional management schemes are not appropriate to manage these sensored network and therefore there is the need for a new management scheme.

Real-time communication is necessary in many WSN applications. For example, in a fire fighting application, immediate and appropriate action should be applicable in the area where the disaster occurs without any delay to prevent further damage. The data collected and delivered by the sensor must be accurately valid and without any delay at the time of decision making since inaccurate data and late delivery of data may endanger the lives of fire fighters.

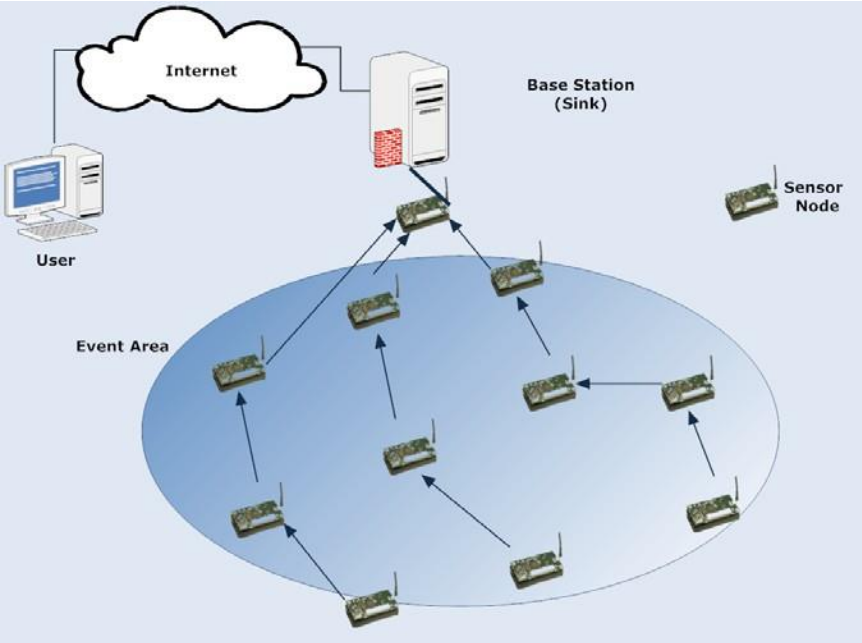

Figure 1.1 WSN architecture with MICAz motes. WSN applications must operate for on a long term basis without any wired power supplies

General research challenges for multi-hop routing in WSN arise primarily due to the large number of constraints that must be simultaneously removed. One of the most important constraints on sensor nodes is the requirement for power consumption. Sensor nodes carry limited as well as generally irreplaceable power sources. WSN applications must operate for on a long term basis without any wired power supplies and also not requiring the replacing nor recharging of the batteries. Therefore power consumption is an important factor to be taken into consideration while designing the multi-hop routing in order to prolong the lifetime of the WSN.

This chapter is organized by firstly presenting related work in Section 1.2. Section 1.3 describes the proposed system design while Section 1.4 explains the simulation study. Section 1.5 discusses the test bed study and finally, Section 1.6 of this chapter provides the conclusion/s drawn on the study.

1.2 RELATED WORKS

A comprehensive review of the challenges and the state of the art of real-time communication in sensor networks can be found in. A routing protocol based on link quality is proposed in the expected transmission count metric (ETX) is developed as the function of a metric is to select the forwarding node.

1.2.1 Related Works

ETX finds paths with the minimum expected number of transmissions to deliver a packet to its destination. The metric predicts the number of retransmissions required by using per- link measurements of packet loss ratios in both directions of each wireless link. The primary goal of the ETX design is to find paths with high throughput, despite losses. However, ETX does not consider the remaining power as an end-to-end deadline.

1.2.1.1 Related Works

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1.2.1.1.1 Previous Study

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1.3 RESULT AND DISCUSSION

To create a realistic simulation environment, we have simulated RTLD based on the characteristics of the MICAz mote from Crossbow. RTLD is simulated and compared to the existing real-time routing protocol. Table 1.1 shows the simulation parameters used to simulate RTLD in Network Simulator-2 (NS-2). In this table and IEEE 802.15.4 MAC physical layers are used. Many-to-one traffic pattern is used which is common in WSN applications. This traffic is typical between multiple source nodes and a sink. In all simulations, each node updates its neighbour table every 180s. In this work, 121 nodes are distributed in a 100 m × 100 m region as shown in Figure 1.3. Nodes numbered as 120, 110, 100 and 90 are the source nodes and node 0 is the sink.

Table 1.1 Simulation parameters used to simulate RTLD in Network Simulator-2 (NS-2)

Parameter	**IEEE 802.15.4**
Propagation Model	Shadowing
Path loss exponent	2.5
Shadowing deviation (dB)	4.0
Reference distance (m)	1.0
Traffic	CBR

1.4 CONCLUSION

This chapter presents the RTLD designed for real-time routing in WSNs. In general, the finding concludes that RTLD provides a good performance in term of delivery ratio, power consumption and packet overhead. This is primarily due to its forwarding strategy that considers the problem of real-time routing protocols.

ACKNOWLEDGEMENT

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REFERENCES

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King, K. 1983. "Development of a Pressurized System for Oxidation Studies of Volatile Fluids." Unpublished Ph.D. Thesis. Pennsylvania University.

Nakamura, S., K. Tajima, and Y. Sugimoto. 1994. "Experimental Investigation on High-speed Switching Characteristics of a Novel Symmetric Mach-Zehnder All-optical Switch." *Applied Physics Letter*, 65(1): 283-385.

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PMA ASSESSMENT GUIDELINES
SEMESTER II, SESSION 2021/2022

Program:
Course Code: MRSF 1233
Course Name: ENGINEERING DESIGN PROCESS & METHODOLOGY
PMA Duration (Hours): 4 WEEKS
Marks Weightage (%): 40%
Course Coordinator/Lecturer: ASSOC. PROF. IR DR SHAMSUL SARIP/ ASSOC. PROF. DR ROSLINA MOHAMMAD

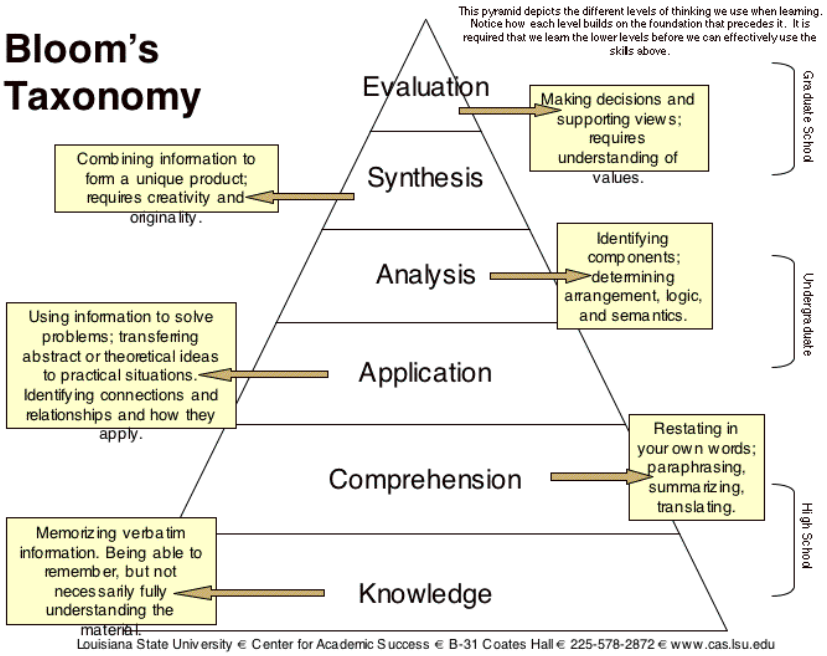
Item classification according to cognitive level:

Item		Marks	Cognitive Level					
No.	CL		C1	C2	C3	C4	C5	C6
1	1	10			X			
	2	10				X		
	3	10					X	X
Total								

Course Code	Cognitive Level (%)					
	C1	C2	C3	C4	C5	C6
MRSF 1233			10	10	10	10

C1 : Knowledge
C2 : Comprehension
C3 : Application
C4 : Analysis
C5 : Synthesis
C6 : Evaluation

Reference



Level	Type of
KNOWLEDGE	Remembering, memorizing, recognizing, recalling identification, recalling information
COMPREHENSION	Interpreting, translating from one medium to another, describing in one's own words,
APPLICATION	problem solving, applying information to produce some result, use of facts, rules and principles: • how is ... an example of ...? • how is ... related to ...?
ANALYSIS	subdividing something to show how it is put together, finding the underlying structure of a communication, identifying motives, separation of a whole into component parts • what are the parts or features of ...? • classify ... according to ... • outline/diagram ... • how does ... compare/contrast with ...?
SYNTHESIS	creating a unique, original product that may be in verbal form or may be a physical object, combination of ideas to form a new whole • what would you predict/infer from ...? • what ideas can you add to ...? • how would you create/design a new ...? • what might happen if you combined ...? • what solutions would you suggest for ...?
EVALUATION	making value decisions about issues, resolving controversies or differences of opinion development of opinions, judgements or decisions • do you agree that ...? • what do you think about ...? • what is the most important ...? • place the following in order of priority ... • how would you decide about ...? • what criteria would you use to assess ...?