UNIVERSITI TEKNOLOGI MARA

AN IOT-BASED OVITRAP SYSTEM APPLIED FOR *AEDES* MOSQUITO SURVEILLANCE

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ABSTRACT

Since the number of dengue fever cases has become the endemic disease in Malaysia, there is an urgent need for rapid and efficient calculation of mosquito population particularly for early detection and control measures. An ovitrap surveillance is used to determine the density of Aedes mosquito and it is one of the implemented methods for vector control application. In this study, the prototype of an IoT-Based ovitrap system was developed to automatically and simultaneously detect the Aedes mosquitoes using NodeMCU as the main IoT platform. The existing sticky ovitrap was modified to integrate the selected IoT components and to ensure its functionality for automatic detection. There were two phases being carried out in this study in which phase 1 evaluated the right and suitable IoT components to be selected and applied for automatic detection. Integrating the selected IoT components and modification of present ovitrap was carried out in phase 2 and the final revised design was considered. SWOT analysis and Pugh chart analysis, also known as decision matrix method, were used to select the best IoT components and final ovitrap design. It has been observed that prototype D was the best design and able to detect the adult mosquitoes. Based on the lessons learned in the development of IoT-based ovitrap, the VL503LOX V2 Distance Laser Range Sensor is over sensitive in detecting mosquitoes and less attracting as compared to conventional ovitrap. Thus, a few modifications to this prototype have been recommended to be employed for Aedes mosquito's surveillance in future studies.

Keyword : Arduino, Aedes mosquito, IoT, NodeMCU, Ovitrap

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CHAPTER ONE
INTRODUCTION

1.1 Background of the study

Dengue fever is a disease that has become a major issue in international public health and it has been increasing in Malaysia since 40 years ago. It is a virus-caused disease that spreads through the bite of the mosquito *Aedes aegypti* and it is more prevalent in urban areas. Dengue fever is rarely fatal; however, if left untreated, it can develop into haemorrhagic fever stage that can lead to higher mortality rate. The Ministry of Health reported that from January 2018 till October 2018, there were 59, 915 cases informed and the death of 229 were reported throughout Malaysia. On top of that, Selangor was the worst affected state. The ultimate spread occurs in late monsoon season in East Malaysia (Sabah and Sarawak) from October to February and July to August in West Malaysia (Ministry of Health, 2018).

Ministry of Health had implemented many strategies specifically to control and prevent the disease from spreading. Control measures include using the web-based real-time monitoring system, namely e-Dengue and a dengue epidemic management system (SPWD) to enhance surveillance on case locality and the outbreak of dengue. There is no specific treatment or effective immunisation, but dengue prevention and control programmes must depend primarily on vector control (Lenhart et al., 2005). In Malaysia, integrated control measures which include source reduction, health education and legislation, insecticide space-spraying, and other efforts have been made to reduce the number of adults *Ae. aegypti* bites at the household level. According to Morrison et al. (2008), if the surveillance and control measures are done properly, *Ae. aegypti* suppression is a practical method to control urban dengue, yellow fever, and chikungunya viruses.

Ovitrap is a small, simple and low-cost device for detecting the existence of adult female mosquitoes without the use of pesticides that do not require long-term maintenance (Roberto et al., 2013). An ovitrap comprises a container where the inside of the container is dark in colour. The wire mesh is attached to the inside of the container where mosquitoes can lay their eggs. The eggs are then dropped into the water through