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M-ZeroStag Effect to Reduce Dengue Mosquito Breeding

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KEYWORDS

Incidence of dengue fever
Stagnant water
RSM
Recycled HIPS
ABS

ABSTRACT

The World Health Organization (WHO) has reported a drastic increase in the incidence of dengue fever cases over the decades with an average of 390 million new infections reported each year. The best method proposed by the Ministry of Health Malaysia to reduce the breeding of Aedes mosquitoes especially in schools by eradicating stagnant water spots. This is because most places especially schools have abandoned ponds and tanks as well as problematic drain systems that can hold water for a long time. Based on this problem the M-Zerostag was develop by using the Microbit controller. Through on this system it will keep the place dry in a short period of time. Pumped water can be channeled directly to plants or water storage tanks for crops. Result show that the system can siphon water when the water level reach 0.5mm. This system has higher efficiency until 99% and the water can be siphon until dry up on the short time. The risk of dengue fever can be reduced at the same time that the sustainability of nature can be maintained.

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1.0 INTRODUCTION

Dengue fever is a dynamic vector-borne disease. Therefore, dengue prevention and control activities should involve cohesive cooperation from various ministries, departments, agencies and the public. The holistic and comprehensive involvement of various ministries and agencies can reduce the spread of dengue fever to a minimum extent so that dengue disease is no longer a threat to the well-being of the people. In this regard, the best way to prevent dengue fever infection is to control the density (density) of Aedes mosquitoes in the environment through the removal of water reservoirs that cause the breeding of Aedes mosquitoes [1].

Repeat control structures and options in microcontroller Microbit are used to control the system. M- ZeroStag created pumping stagnant water and sent to a temporary tank. The water will be channelled to the plants. The risk of dengue fever can be reduced at the same time that nature's sustainability can be maintained [2].

Programming is carried out online to give instructions to Microbit. Instructions in Block and JavaScript forms. Blocks each other to determine which program your microbit will run. Blocks can be an event or need to be included in an event to run [3].

Microbit are very small and compact, however they have a lot of power and RAM, 16KB though, making it limited in its capabilities. They can be programmed in many languages [4]. The recent introduction of computer science (CS) education into schools in many countries has led to a surge in interest in programming tools and approaches which make CS concepts and tasks engaging, motivating and accessible to all. There is renewed interest in supporting learning through physical computing, which has been shown to be motivational whilst offering opportunities for collaboration and creativity [5].

The Goal, Question, Metrics (GQM) approach was adopted as it represents a systematic approach for defining and evaluating a set of operational goals using measurement [6]. Recommendations for more teacher professional learning opportunities around physical computing. The results of this qualitative study will be useful to teachers and teacher educators wishing to work more effectively with physical computing in the classroom [7].

The system firstly senses the amount of water available in the tank by the level detector part and then adjusts the state of the water pump in accordance to the water level information. This electronic design achieves automation through sequential logic implemented using a flip flop. A seven segment display and a relay-based motor pump driving circuit are part of this integrated design [8]. Water Level management approach would help in reducing the home power consumption and as well as water overflow [9]. This algorithm offers a maximum opportunity of delivery of water level information packets/signals to base station as it also computes a threshold as well as does calculates values based on transmission range [10].

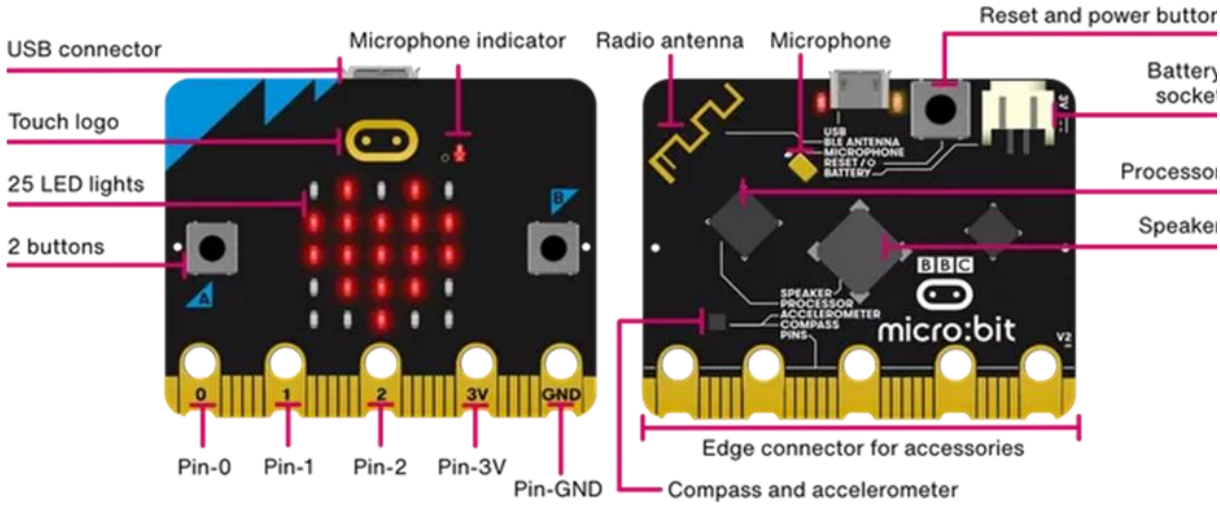
The orientation and tilt position of the solar panel affect the amount of solar radiation that falls on the panel surface over the course of the day and indeed the year. The choice of tilt angle for a solar panel is fundamental to its efficient operation because incorrectly positioning the solar panel leads to an unnecessary loss in potential power [11]. Sunlight should fall with steep angle to extract maximum power from solar panels. Therefore, optimum fixed tilt angles of solar panels should be changed monthly and seasonally [12]. Solar panels alone induce regional cooling by converting incoming solar energy to electricity in comparison to the climate without solar panels [13]. Photovoltaic (PV) array analytics and control have become necessary for remote solar farms and for intelligent fault detection and power optimization. The management of a PV array requires auxiliary electronics that are attached to each solar panel [14].

Usually gravity can be neglected for planning vessels at very high planning speed. However, if the planning speed becomes lower, the influence of gravity must be considered [15].

2.0 METHODOLOGY

2.1 Materials and Equipment

Microbit V2 Board micro:bit is a tiny programmable computer, designed to make learning and teaching. IoT:bit is an extension boards based on IoT micro bit online. Iot boards uses ESP8266 as a WIFI extension boards and serial port to communicate with microbit. It also has extended all available IO ports of the micro:bit which is led by GVS and can extend various 3V E-blocks as LED, photosensitive, and servo by using it. 100W 18V Mono Solar Panel Dual 12V/5V DC USB Monocrystalline Flexible Solar Charger. We also using Mini Water Pump power 3W, 0.18A Voltage 5V DC. simple and small portable water level/water droplet identification, detection sensor water that have high cost performance. Complete water yield and analog conversion, the output value apply to your custom function. It is low power consumption and high sensitivity with working Voltage DC 3-5V and Working Current less than 20mA. Figure 2.1 shows the Microbit controller and components used for development of M-ZeroStag.



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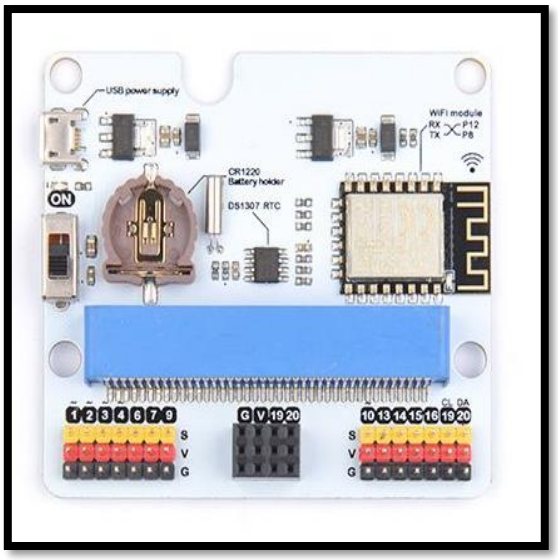
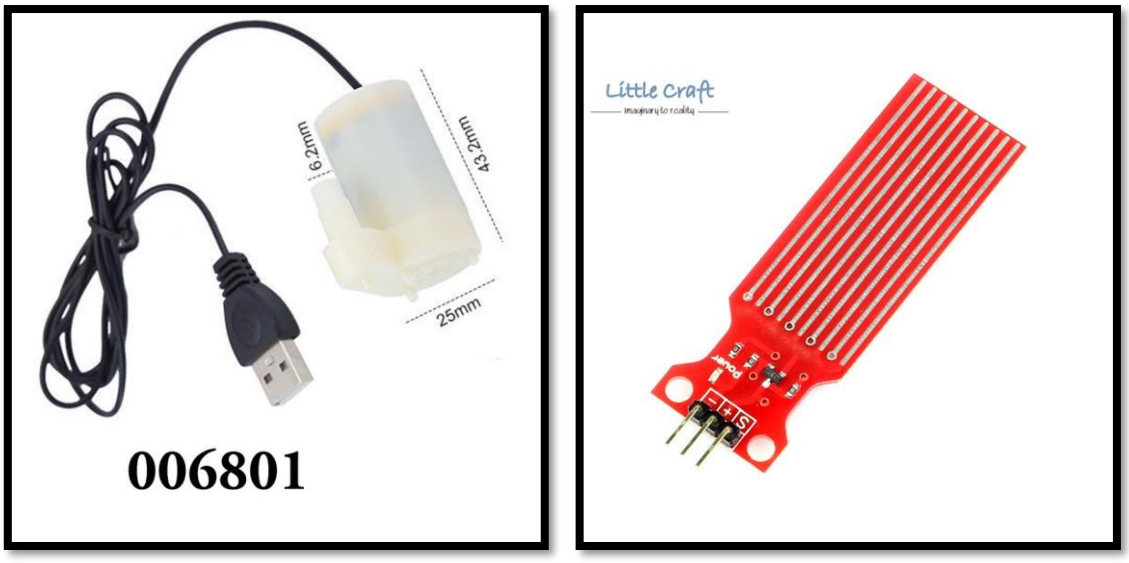


(b)

(c)



(d) (e)

Figure 2.1: (a) Microbit, (b) IoT Extension Board, (c) PV Solar Panel, (d) Submerge Pump and (d) Water Level Sensor

2.2 Design of Experiment

The function of M-ZeroStag is to remove stagnant water for avoiding the dengue lay eggs and spreading. This system will be operating when the level of stagnant water reach until 0.3 to 0.5mm. This system will siphon water out to stagnant containers. Process of this system is show on Figure 2.2.

1. The rainwater that falls will fill certain places and cause water to stagnate. The water will disappear through the evaporation process some time depending on the temperature, weather, surrounding wind. However, some reservoirs that slow water loss can cause other problems such as the breeding of Aedes mosquitoes.
2. The level sensor will be placed in the deepest water place on a reservoir such as a pond.
3. The pump will start operating when the water exceeds 0.3 cm in the reservoir.
4. The electricity generated by Solar panel and stored in the battery is used when the system is operating.
5. The pump will stop when the water level is 0.3 cm – 0.5 cm
6. The pumped water will be channeled to plants or adjacent storage tanks.

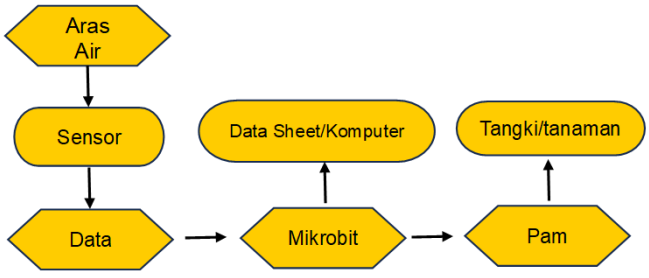


Figure 2.2: M-ZeroStag Operation Architecture

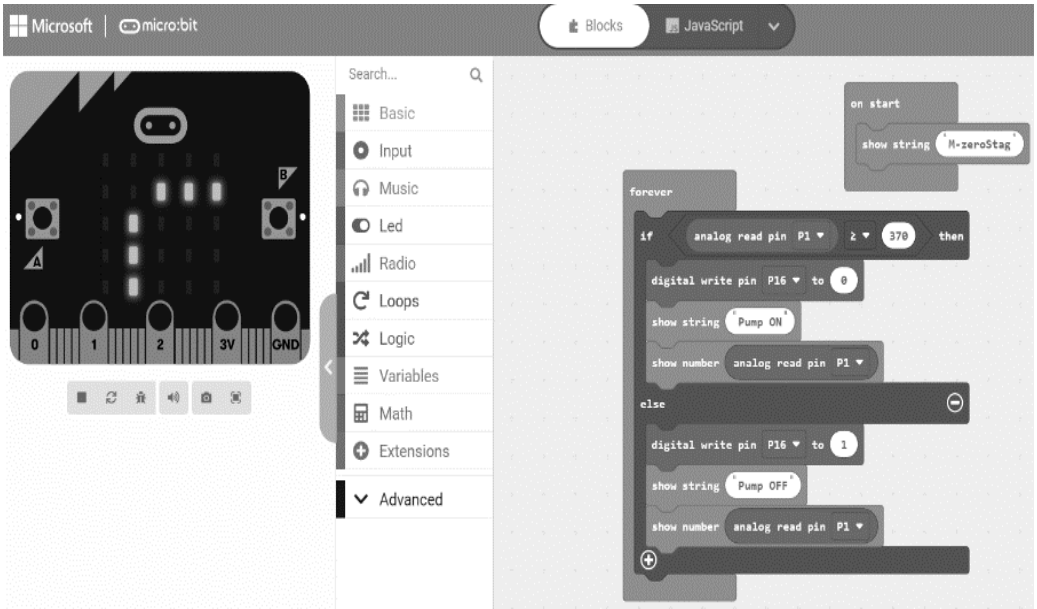
Block programming and JavaScript are two programming languages commonly used with the microbit to enable user to create and interact with various projects. The explanation of functions block and JavaScript programming in microbit:

1. Block Programming

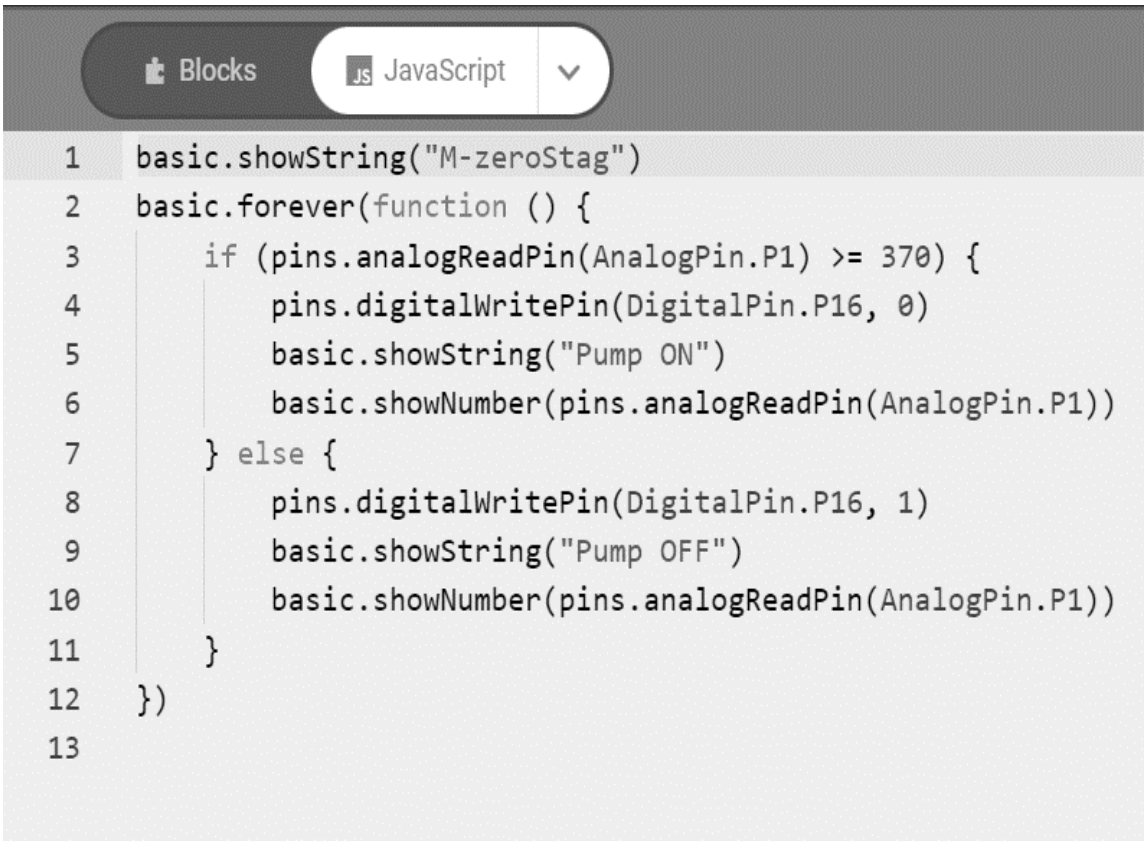
- Visual Programming: Block programming for the microbit typically involves a drag-and-drop, visual interface where users can create programs by snapping together code blocks. This approach is highly user-friendly, making it accessible to beginners, especially those with little to no prior coding experience.
- Simplicity: Block programming simplifies coding concepts by abstracting code into visual blocks that represent actions, events, and logic. Users can create programs by arranging these blocks in a logical sequence, reducing syntax errors and debugging difficulties.
- Immediate Feedback: Block programming environments often provide immediate feedback, allowing users to see the results of their code as they build it. This feedback loop is crucial for learning and experimentation. Figure 2.3(a) show the program M-ZeroStag using block programming.

2. JavaScript

- Text-Based Programming: JavaScript is a widely-used text-based programming language. It offers a more traditional coding experience compared to block programming. With JavaScript, users write code using text, which can be a more advanced and versatile way to program the micro:bit.
- Advanced Programming Concepts: JavaScript allows users to delve deeper into coding concepts like variables, loops, conditional statements, and functions. This is beneficial for learners who want to advance their coding skills beyond the basics.
- Real-World Relevance: Learning JavaScript has real-world applicability since it's one of the most popular programming languages used in web development. This knowledge can be valuable for users interested in pursuing careers in technology. Figure 2.3(b) show the Javascript programming for M-ZeroStag system.



(a)



(b)

Figure 2.3: (a)Programming using Blocks and (b) Programming using Java scripts

3.0 RESULTS AND DISCUSSION

It can be observed after performing test, the results were analyzed to study the effect were in Cost Reduction, Time saving, System efficiency and Effectiveness in the prevention of dengue fever

Cost may reduce using renewable energy sources. Does not require human resources for operation.Auto-propelled control. Using microcontrollers such as Microbit that can carry out operations accurately without periodic observation and monitoring by humans. Refers to the national dengue prevention and control strategic plan 2022-2026. "Until now, there have been no specific drug treatments or effective vaccines to deal with dengue fever infection. Therefore, the best way to prevent dengue fever infection is to control the density (density) of Aedes mosquitoes in the environment through the removal of water reservoirs that cause the breeding of Aedes mosquitoes." Elimination of water reservoirs is the most effective method of preventing dengue. Figure 3.4 show the data streaming for M-ZeroStag water level when it exceeds the level setting.

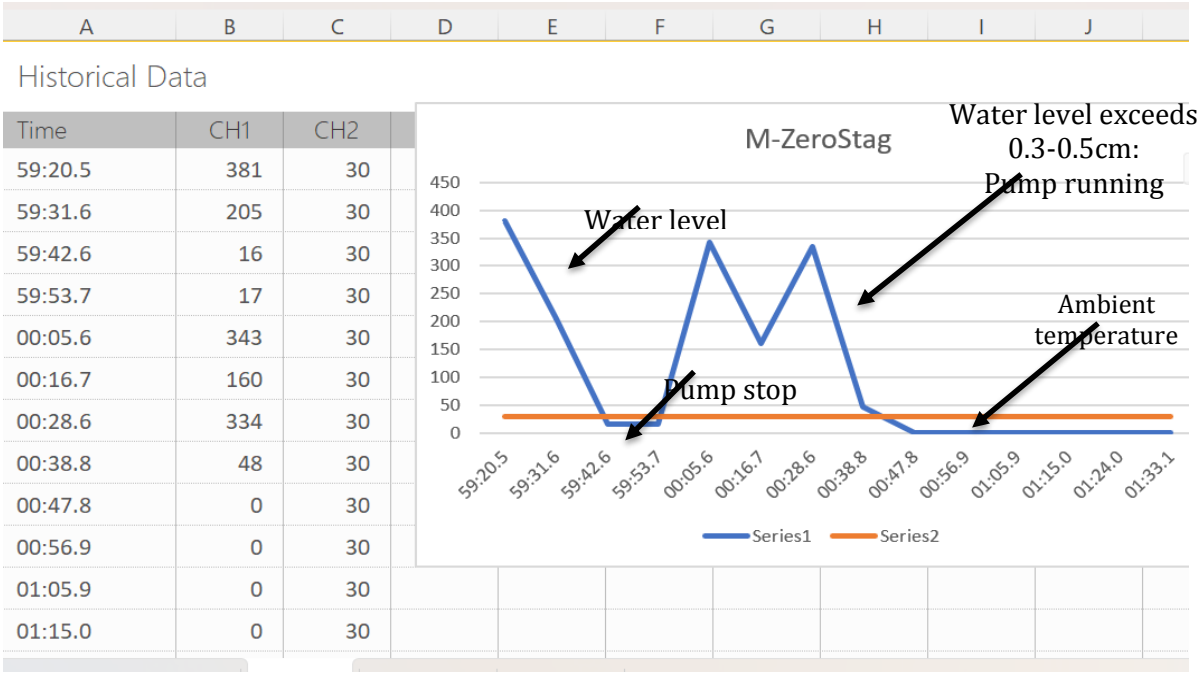


Figure 2.4: Data Streamer from M-ZeroStag System

4.0 CONCLUSIONS

M-ZeroStag is the best way to reduce the breeding of dengue mosquitoes especially in schools. This is because most schools have abandoned pools and tanks as well as problematic drain systems that can hold water for a long time. M-ZeroStag will keep the place dry in a short time. The use of Microbial Controllers is in line with the current technological developments in line with IR 4.0.In the meantime, the use of manpower can be limited and efficiency can be increased by reducing human error or Human error. This system that is fully controlled by the Microbit can save time on the process of pumping water. The pumped water can be channeled directly to plants or water storage tanks for plants. The risk of dengue fever can be reduced at the same time that the sustainability of nature can be maintained.

M-Zerostag will be improved by connecting the existing system with the internet. This allows the system to be controlled via a mobile phone. Create APPS to control the system. The advisory and recognition services from local universities through a combination will enhance the efficiency of M-Zerostag. Estimate the number of pumps at one microbit. Aim to increase water levels from reservoirs to temporary plants or tanks.

Author Contribution

Adi Haizan: Conceptualization, methodology, investigation, visualisation, writing and editing. Uzair Izz: Investigation, supervision, writing, and editing. M.Farees Hayqal and N. Aisyah Azmizee: Methodology, writing and editing.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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