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Vehicle-Tracking Mobile Application without a GPS Sensor

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ABSTRACTS

A GPS sensor is the main part of the system in vehicle tracking applications. However, a GPS sensor becomes the limitation of low-cost vehicle tracking applications because a GPS sensor comes with the running cost of our vehicle tracking system. To solve this problem, this paper presents an IoT based concept to track a vehicle without a GPS sensor. To evaluate the proposed concepts, a light sensor and a vibration sensor have been compared to show the real-time data. The proposed algorithm shows that the vibration sensor provides a high accuracy more than a light sensor.

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1. INTRODUCTION

Nowadays, vehicle tracking systems have been developed in many applications. Basically, the tracking system is based on Global Positioning System (GPS) where communication with satellites is used to get the coordinates of an object among other vital information (Alam, *et al.,* 2017). Shipping industry was the first application of the vehicle tracking system. Such the shipping application was implemented to track the vehicle location in real-time (Ofusori, *et al.,* 2018). In addition, hybrid vehicles (HV) and plug-in hybrid electric vehicles are the new challenge of the vehicle tracking applications. The idea of applying vehicle tracking concept is to collect and share data on web applications in order to provide useful information for driving a vehicle over a particular path (Li, *et al.,* 2017). In Nalajala *et al.,* (2017), an advanced vehicle monitoring, and tracking system has been proposed by using Raspberry Pi. The benefit of the advanced vehicle tracking system is that the real time information would provide safety environment for travellers (Nalajala, *et al.,* 2017). In addition, the real time vehicle monitoring has been proved that social problems can be achieved (Gao, *et al.,* 2017). However, the vehicle tracking system need a GPS sensor. This is the limitation of many applications. This paper presents IoT based concept to track a vehicle without a GPS sensor. To evaluate the proposed concepts, a light sensor and a vibration sensor have been compared to show the real-time data. The proposed algorithm shows that the vibration sensor provides the high accuracy more than a light sensor.

2. METHODS

To track the vehicle in particular part, a vibration sensor and a light sensor have been installed to the E-Bus (University Bus) instead of a GPS sensor. The difference data patterns during moving and stopping the E-Bus have been measured in real-time. The IoT concept is used to analyze the real-time measured data. The user interface based on android mobile application has been developed to provide where station of E-Bus is in real-time. **Figure 1 and 2** show the block diagram of the proposed algorithm and IoT concept diagram. In order to calculate the distance of E-Bus in real-time, the data analytics of IoT diagram relies on a basic formula v = s/t.

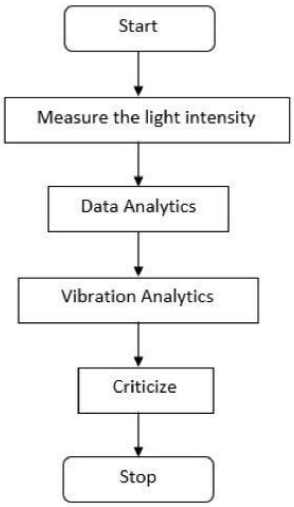

Figure 1. System flow chart.

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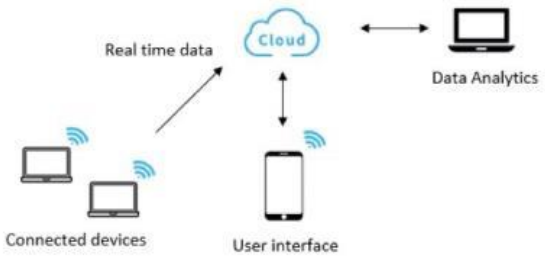

Figure 2. IOT diagram.

3. RESULTS AND DISCUSSION

The resulting information in The distance as shown in **Figure 3** and **Table 1**.

distance	A	B	C	D	E	F	G
distance	265.64m	678.35m	366.98m	103.51m	548.65m	190.156m	146.27m

Table 1. Path data for E-Bus.

To evaluate the proposed idea, a vibration sensor and a light sensor have been installed to the E-Bus. **Table 1** shows the station and distance information. **Figure 3 and 4** show the measured data from a light sensor and a vibration sensor, respectively. **Figure 5** shows the mobile application for a user interface. The below data shows the results of vehicle tracking based on a light sensor and vibration sensor.

Light sensor: at point 1 are 96.3 cd/m2, point 2 are 98.6 cd/m2, point 3 are 99.41 cd/m2, point 4 are 98.73, point 5 are 98.73, point 6 are 98.63, point 7 are 98.73, point8 are 98.73 Vibration sensor: at point 1 are 22 mm/s, point 2 are 24 mm/s, point 3 are 24 mm/s, point 4 are 24mm/s ,point 5 are 26mm/s, point 6 are 29mm/s, point 7 are27mm/s.

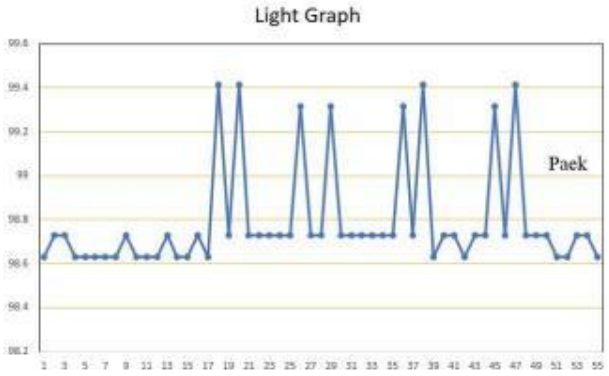

Figure 3. Measured data based on a light sensor.

Figure 4. Measured data based on a Vibration sensor

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Figure 5. Developed mobile application.

4. CONCLUSION

This paper shows the new concept of vehicle tracking in real-time without a GPS sensor. To realize the proposed concept, a light sensor and a vibration sensor have been tested to compare the possibility of tracking vehicle in the specific part such as a university road. The experimental results show that a vibration sensor provides the best tracking information for vehicle in real-time.

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