Automation Strategy of Asset Tracking and Monitoring Via Integrated Sensor Tagging

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Abstract. It is becoming increasingly difficult to ignore the vital purpose of asset tracking and monitoring process in any organization. Correspondingly, the sustainability of an organization depends on its ability to monitor and track its assets and its values. Most of the organization currently taking those processes for granted despite of its impact towards the organization. The ignorance of organization concerned with the unavailability of comprehensive strategy. The research to date has tended to focus on separate method for asset tracking components and development components rather than mapping both components. Thus, this paper aims to examine the mapping strategy between those components. The automation strategy includes four various techniques such as the access point development, the asset movement tracking, the asset monitoring recording and miniature construction. Basically, automation strategy development was properly executed by literature review study, identification of component of asset tracking and monitoring processes, development components identification and mapping of asset tracking components and development components. Since we are stepping into Industry Revolution 4.0, it is expected that organization must be able to automate the asset tracking and monitoring processes. Hence, software development community can utilize this automation strategy for the development of their asset tracking and monitoring system.

Keywords: STEM, Industry Revolution 4.0, Equipment's movement, IoT, Internet of Things.

INTRODUCTION

As we are step into the Industry Revolution 4.0 (IR4.0) the automate become an undeniable concept in various industries. Automation accounts for building integration between the machine and the computer aided software. As time goes, the integration become a commonly discussed technology among all age group of society. On the other hand, the Internet of Things (IoT) has gained a striking development as the supportive tools for those integration between machine and computer software (Haidegger, 2017). Internet of Things (IoT) has a feature to enable tracking and monitoring of an asset via an ability to read the movement of a things. This remarkable function had impact many organization in managing and organizing their assets. Even though, the feature is seeming to be useful, many organizations are keeping away from involving into this automated tracking process due to the unclear approach in developing and implementing it. Previous

work on automate strategy been limited to separate asset tracking component development from it software development. The core problem of integrating both has not been addressed in those separated developments. So, the current approach is impractical to be applied in tracking and monitoring those assets since there involve many processes. The aim of this paper is to identify and present the approach or strategy which can integrate the asset tracking hardware component with the software development component. The simple approach which suggested in this paper mainly focused into small education industry in managing their asset tracking with the lower and affordable cost. The first section of the paper gives brief overview of past researches or technologies involved in asset tracking and monitoring. Problems regarding the separating the asset tracking components and software development components is identified the following section of the paper. A discussion on research method used discussed on section number three followed by the explanation of asset tracking strategy.

LITERATURE REVIEW

Inventory is a stock or store of goods. Inventory control management is the core activity of operation management. Good inventory control management is important for the effective operation of most firms (WU, Ouyang, Tang, & Ting, 2018). Inventory control management is a vital process which contains much more complicated techniques and strategies. Additionally, the inventory management is consisting of processes which are similar across the domains it belongs to (Wild, 2017).

Inventory Control Management Approaches

Given the fact that, inventory control management exist in variety of approaches. Among those approaches, the most significant approach is algorithmic approach to compute provably good ordering policies. This model expected to guaranteed to be within a constant factor of the optimal expected cost (Levi, Roundy, Truong, & Wang, 2016). Cost had become central issue in managing inventory which believe to be rectified by those algorithmic approach. Recent development in inventory management has highlighted the needs for economic and environmental consideration. As supportive of that, a model which utilizes the Pareto technique was proposed in the context of numerical studies (Konur, Campbell, & Monfared, 2017). Even though inventory control management also has been linked into manufacturing industries, the needs of it has been tremendously extended into education institution to manage their inventory like the facilities in the classroom, the equipment and etc. Those facilities and equipment which is also known as assets are important to be tracked. Asset tracking become increasingly important in determining a sustainability of an organization.

Asset Tracking Strategies

Initial studies of asset tracking systems used Radio Frequency Identification (RFID). It had significant challenges, such as missing reads which later were solved via the scalable tracking algorithm. This algorithm utilizes an object compression technique (Sankarkumar, Ranasinghe, & Sathyan, 2014). Following to that, asset tracking was

conquered by the use of mobile via wireless network. In advance, the mobile has the positioning capabilities without using a positioning hardware (Roslee & Othamn, 2015). Even though at that period of time mobile frequency was extensively utilized, yet there were still believes in the capability of RFID to track the physical location of an asset such as library books (Muthuselvi, 2016). The asset tracking strategies has been slowly evolving and currently it is turn to the era of Internet of Things (IoT).

IoT as a Tool for Asset Tracking

The term of Internet of Things (IoT) was introduced by the Kevin Ashton. He describes a system where the Internet is connected to the physical world via ubiquitous sensors (Madakam, Ramaswamy, & Tripathi, 2015).

"An open and comprehensive network of intelligent objects that have the capacity to auto-organize, share information, data and resources, reacting and acting in face of situations and changes in the environment"

Internet of Things (IoT) is evolving and completely to be the finest, most researched concept in the computing arena. The past decade has seen a huge growth of IoT by showing the concept of extensive facilities and network enabled objects, connect anytime regardless of place and things (Kosmatos, Tselikas, & Boucouvalas, 2011). Following to the advancement of IoT it has seamlessly been used for the inventory control management purpose.

RESEARCH METHODOLOGY

In an attempt to achieve target in creating extensive automation strategy, clear research activities were executed. These activities simplified into the research activity flow diagram as shown in Figure 1. It contains three main phases which each has its own objective to achieve and respective deliverables to produce. The component needed for automation strategy was identified using the literature study. Based on the literature study there are few steps were identified. Those processes are viewed as the significant processes in automating the asset tracking and monitoring. Once the processes were identified, it leads to the development process where the Arduino used in creating the asset tracking kit. The high-level view of architecture diagram was produced as part of identifying the asset tracking components. Those asset tracking components were then mapped with the development components in generating the integration between development and asset tracking.
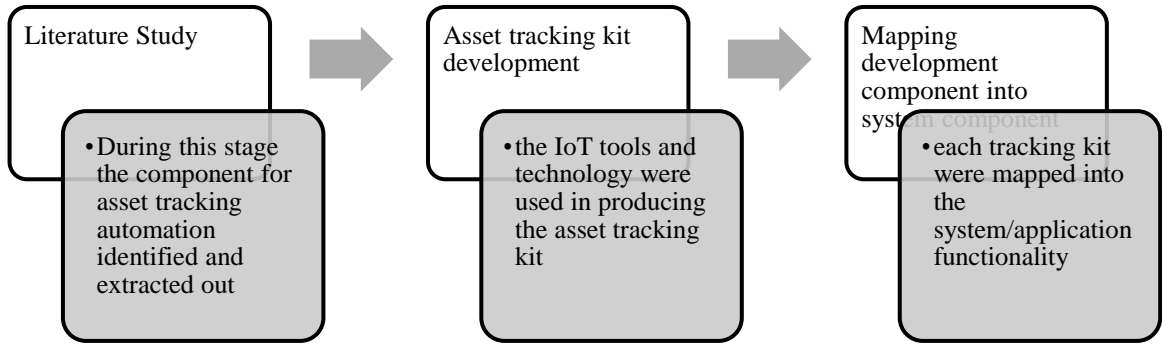
FIGURE 1. Research Activities.

ASSET TRACKING AND MONITORING AUTOMATIONS STRATEGY - DISCUSSION

Based on the literature study, there are few components were identified as the needed component for asset tracking automation.

Component 1: IoT board which contains the tracking ability
Component 2: location detector
Component 3: wireless adapter

Figure 2 shows the architecture for automation of asset tracking. This illustration shows the location detector, wireless adapter components and the application itself as the components for automation and how it is interconnected.
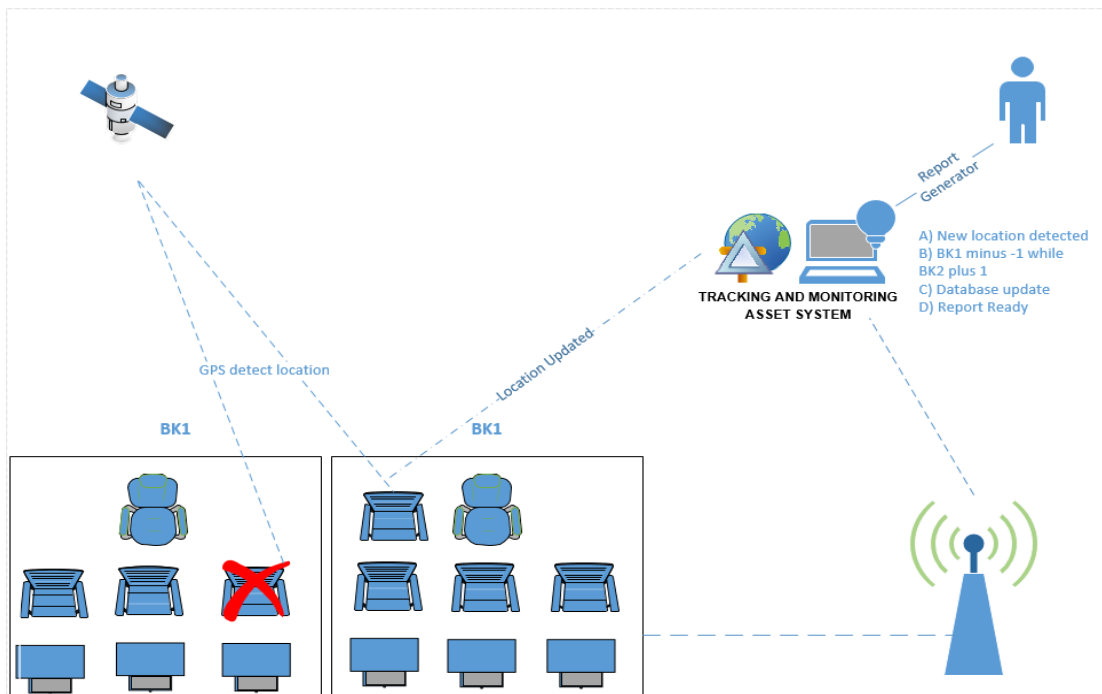

FIGURE 2. High Level Architecture.

The strategy for the application development includes adding the new asset categories. For any asset tracking system, the category of asset is very important in keeping their records. So, it is vital to include this step when automate the asset tracking. Similarly, the function to add new asset also available in asset tracking which allow to insert the new asset which is belong to an organization. In addition to that, the quantity of each asset also need to be specified to increase the ability to tracking and monitoring. Apart from that, a function to generate the tagging code also needed as there are new asset will be coming in. The tagging code consist of random numbers which are unique for an item. The asset management office should be responsible in setting the current location of each asset that has been tagged. The integration or mapping between the asset tracking physical components and asset tracking applications were established in order to track and monitor the movement of asset from original place to its new location.
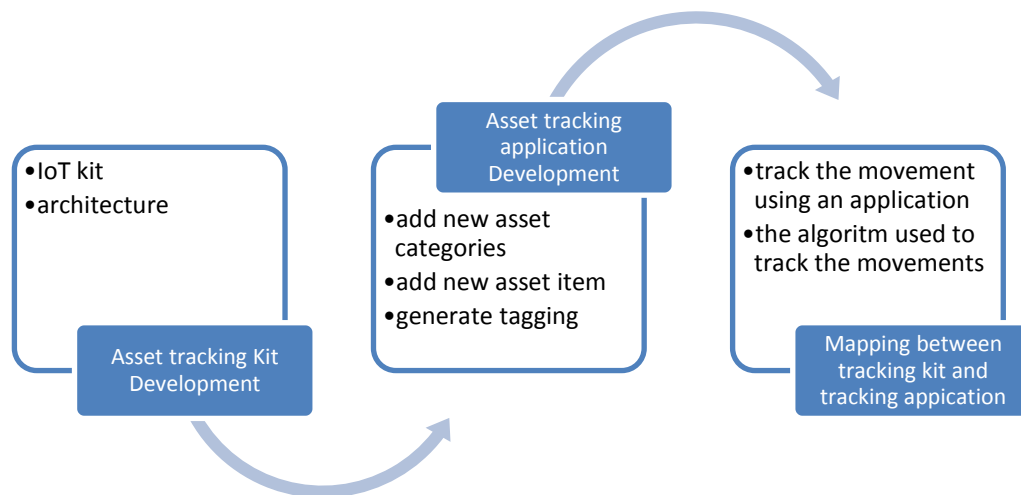
CONCLUSION

This paper has given an account of concertation on the asset tracking and monitoring automation. The result from this study intimates that the integration between tracking kit and software application can be achieved by having a mapping strategy. An implication of this possibility would open up the opportunity for the organization to keep track of their asset in more efficient manner. We have obtained comprehensive results proving that mapping strategy would be useful in IoT based applications construction. In spite of the fact that there are limitations due to lack of algorithm development for the proposed strategy. However, the proposed strategy has huge impact to the organization and to the society as overall.

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