

Design and Development of Cost-Effective Automatic Location Identification for Campus Monitoring

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Abstract — Untraceable theft equipment is one of the problems faced by university campus. Some of these stolen equipments are untraceable due to their small size and portability. Lack of real-time notification and tracking ability of the stolen equipment prevents prompt and effective actions to be taken. Therefore, an system needs to be deployed within the campus that makes it possible to track down equipments once they are stolen.

The purpose of this research work is to design and develop automatic location identification (ALI) system for security purpose based on the GPS technology. The coverage area of the tracking is within the Universiti Malaysia Sarawak (UNIMAS) area. This research work involves stages such as creating an electronic map of the campus, identification and set up of the hardware that is used to communicate between the GPS receiver and the server and finally developing a program that can perform the calculation and mapping operations. Research methodology will be explained in this paper and detailed process of the development of the system will be described. The developed system allows real-time notification in the event of equipment being stolen and has the ability to perform automatic tracking once the equipment is taken away from a predetermined parameter. It also has function that can record the movement history of the equipment for the purpose of later analysis. Due to its simplicity and low-cost, the system can be easily developed and applied in order to prevent the occurrences of equipment being stolen.

Keywords — Automatic Location Identification, GPS, Cost-Effective, Campus Monitoring

I. INTRODUCTION

The development of the new campus for the Universiti Malaysia Sarawak (UNIMAS) in Kota Samarahan has been one of the major milestones for higher learning education in Sarawak. The new campus has been built on a piece of land with the size of about 2,000 acres. Due to the size of the campus, monitoring and security are some of the major

concerns especially for expensive equipment that belongs to the university. Unauthorized removal of equipment is one of the problems that the university has to handle. The unavailability of real-time notification and tracking ability of the stolen equipment prevent prompt and effective actions to be taken. Therefore, a system needs to be designed and deployed within the campus that will make it possible to notify and immediately track down equipments once they are stolen. Positioning technologies can be applied for this purpose [1 - 2].

II. RESEARCH OBJECTIVES

The purpose of this research work is to design and develop an automatic location identification (ALI) system for security purpose based on technology such as GPS [3 - 7]. The coverage area of the tracking is within UNIMAS in order to track missing equipments of the university.

The objectives of this project are to create an electronic map that can be used to find the location of the equipments, to design and set up the hardware that will enable communication between the GPS receiver and the server and finally develop a program that can be used to perform the calculation and mapping operations.

III. METHODOLOGY

This research work can be divided into hardware and software parts. The hardware part consists of the GPS modem unit, a mobile phone and also a PC. The software part consists of the Graphical User Interface (GUI) that is used for monitoring as well as the electronic mapping. Figure 1 shows the ALI system architecture while Figure 2 shows the system software architecture. From Figure 1, the mapping software as well as the GUI will be run by the PC (CPU). The GPS tracker will be attached to any equipment and information will be sent by the GPS tracker to a mobile phone in the event of equipment being removed without authorization. The mobile phone is connected to the PC allowing real-time monitoring and tracking to be performed. The proposed ALI system network is given in Figure 3.