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Multi Sensors Application for Automatic Portal Access in Residential Complexes

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Multi Sensors Application for Automatic Portal Access in Residential Complexes

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Abstract. The purpose of this study is to implement multiple sensors for automatic portal access. More and more people who live in housing complexes, especially middle and upper economic circles, are increasingly vulnerable to security systems in housing complexes. This is because the guard officer may not be on guard for 24 hours without stopping. For this reason, an automatic portal system is needed to overcome the security system in the housing complex, so that people living in the housing complex feel comfortable because they are protected from crimes that can occur in the housing complex. The method of this research is field analysis which goes directly to the field to see the current conditions and housing shortages. The results and research are expected to help realize smart housing that has used RFID in its security system. And the expected impact of this research is to be able to realize smart housing that can read information from a small device called a TAG or Transponder (Transmitter and Responder).

1. Introduction

In this modern era, middle and upper class people who live in big cities prefer housing that has a security system. The security system built using this automatic portal is equipped with various sensors and control equipment with the aim of being a preventive measure in the comfort of residents of residential complexes.

The environmental security system of the developed housing complex is a system that can be accessed by residents of the complex using RFID and Missed Calls.
This security system was made by previous researchers using an Android-based smartphone equipped with recordings using Rapberry Pi [1].and other security systems have also been made by previous researchers by applying RFID and Missed Calls as notifications via SMS [2].
By combining the two results of the research conducted by the first and second researchers, a study was made "Multi-Sensor Application for Automatic Portal Designing in Housing Complexes". So to access the automatic portals of the two sensors (RFID and Missed Calls) a Puzzy algorithm is needed that is used by residents of the complex, especially when the guard is checking the surrounding environment (not in place).

2. Method

Automatic Portal is a system that applies multi sensors to overcome the problems of guard officers who are not in place. The multi sensors used are RFID, call Missed Call and Metal Detectors. RFID is the process of identifying someone or object by using radio transmission frequency. RFID uses radio frequency to read information from a small device called TAG or Transponder (Transmitter and Responder). TAG RFID will recognize itself when it detects signals from compatible devices, namely RFID readers (RFID Reader) (Figure 1) [3].

Figure 1. RFID

RFID is an identification technology that is flexible, easy to use and very suitable for automatic operations. RFID combines advantages that are not available in other identification technologies. RFID can be provided in devices that can only be read (Read Only) or can be read and written (Read / Write), do not require direct contact or light paths to operate, can function in a variety of environmental conditions and provide a high level of data integrity . In addition, because this technology is difficult to fake, RFID can provide a high level of security.

A Missed Call is a medium for sending data via a cellphone that does not require a fee because the connection only tells that someone is going to call. With media like this, it is expected that automatic portal control does not require costs and does not harm the occupants of the housing complex (Figure 2) [4].

Figure 2. Missed Call

Metal detectors known as Metal Detector include inductive sensors. This sensor is usually used in industry and security systems. For example, it is used in detecting the presence of metals in packaged food or unpacked food ingredients. This is so that the product is safe for consumption by consumers (Figure 3) [5].
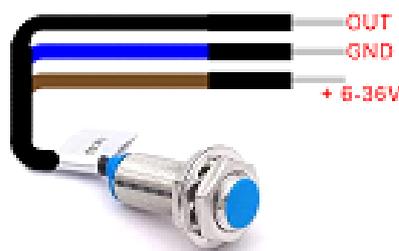

Figure 3. Metal Detector

A metal detector is a device that is able to detect the presence of metal at a certain distance. Metal detectors are very useful or commonly used by security officers to ensure that anyone entering certain areas is free from dangerous objects such as pistols, bombs or sharp weapons, metal detectors are also commonly used by archaeologists to search for metal objects underground or can also be just a hobby to look for metal goods underground [6].

3.   Results and Discussion

To get a good design, the first step of this research is to set the height of the RFID Parking System and the Automatic Portal Barrier Gate by referring to the size of one motorized vehicle, in this case the researcher takes one example of Avanza cars because of the size (length, width and height) can be used as a standard measure in determining the height and distance between an RFID Parking System and Barrier Gate (Figure 4).
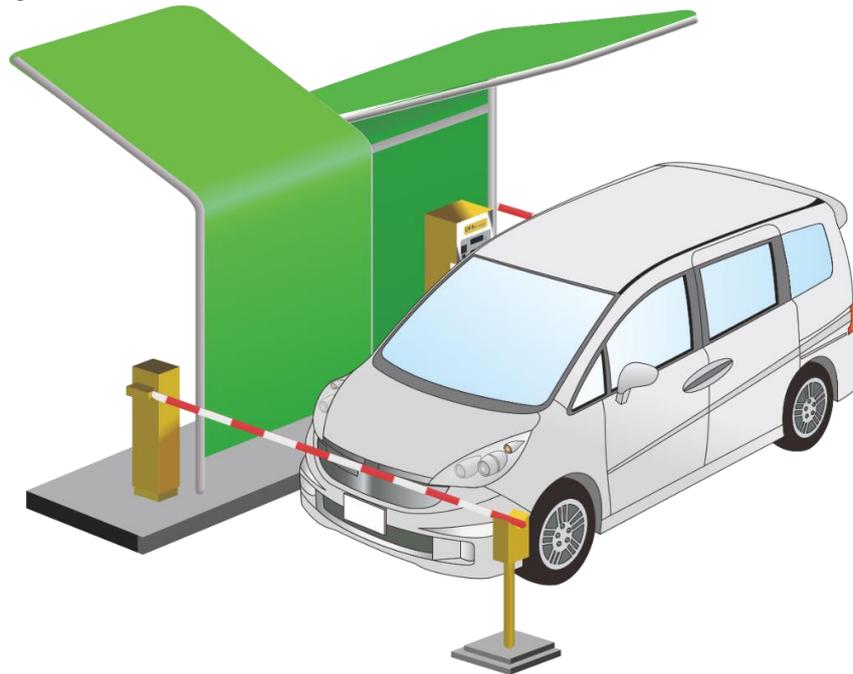
Figure 4. Automatic Portal System Design

Quoted from one of the Toyota Dealers who have a superior product in the form of a Toyota Avanza with a length of 4200mm, width 1660mm and height 1695mm. Thus, for the high size of the RFID Parking System and the Automatic Portal Barrier Gate around 1695mm [7-8].

Figure 5 is the size of a Toyota Avanza car (source: Toyota Dealer in 2019). The safe distance between the Parking System RFID and the Automatic Barrier Gate Portal is set at around 1425mm, the reference is taken from the front step of the Avanza car as shown in Figure 5, of course with the reason to make it easier for residents of the housing complex to use RFID cards that must be put / attached to the RFID card reader in the Parking System (Table 1).

Table 1. Table of Avanza Car Specifications (source of data taken from Toyota Dealer in 2019)

Enrollment in local colleges, 2005

Varian	Veloz 1.3			Veloz 1.5		
	A/T		M/T	A/T		M/T
Long (mm)	4.200			04.02		
Wide (mm)	1.660			1.660		
High (mm)	1.695			1.695		
Whellbase(mm)	2.665			2.665		
Front Distance (mm)	1.425			1.425		
Back Distance (mm)	1.435			1.435		
Ground Clearance (mm)	200			200		
Turning Radius	4,7 m			4,7 m		
Front Suspension	Macpherson Strut with Coil Spring			Macpherson Strut with Coil Spring		
Back Suspension	4 Link Lateral Rod with Coil Spring Disc/Drum			4 Link Lateral Rod with Coil Spring		
Front/Back Brakes	Ya			Disc/Drum		
ABS	Steering and Titl Steering			Ya		
Steering System	185/65 R15			Steering and Titl Steering 185/65 R15		
Tire Size						

*Source:* Fictitious data, for illustration purposes only

The next step is to determine the length of the Automatic Portal bar, because the width of the Avanza car is around 1660mm, so the length of the Portal Automatic bar must be longer than the width of the Avanza car, we just round it around 2000mm assuming that the driver in an emergency can open one of the doors the car especially the car door which is located close to the driver of the car.

Of course the reason this will provide a sense of security and comfort for the driver when entering the gate , the car can freely enter the gate area, which has a gate width that is larger than the width of the car in general (Figure 5) [9].
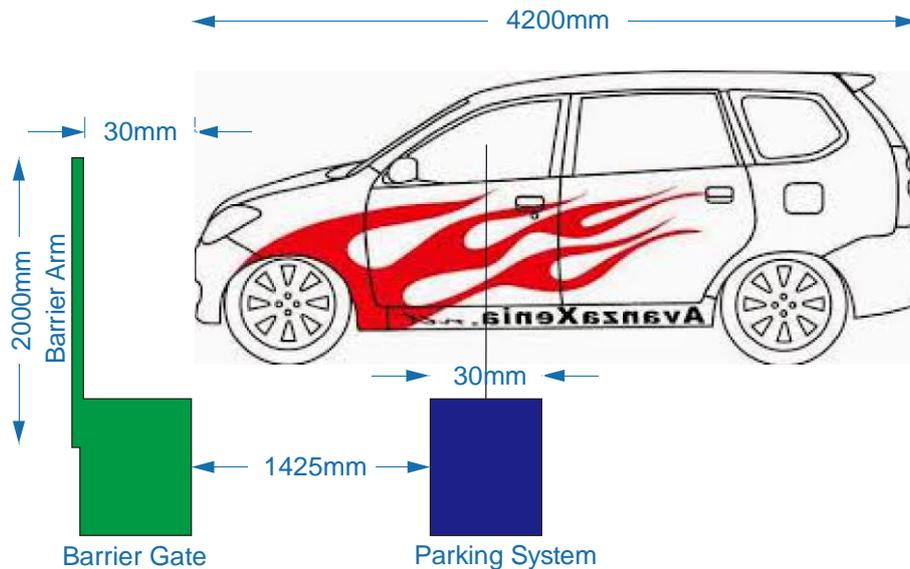

Figure 5. The First Step in System Design

The final step is to determine the area of the Loop Metal Datector so that the car / vehicle that will enter the portal automatically can be detected by the Metal Detector sensor.[10] As we have seen, the length of the Avanza car is around 4200mm and the Barrier Gate width is around 30mm, so the overall length is around 4230mm or we just round about 4250mm, with the reason that when the driver of the car is in position to attach the RFID card to the RFID TAG automatically the entire body of the car will be flowed with induction generated by the Loop Metal Detector coil as shown in Figure 6.
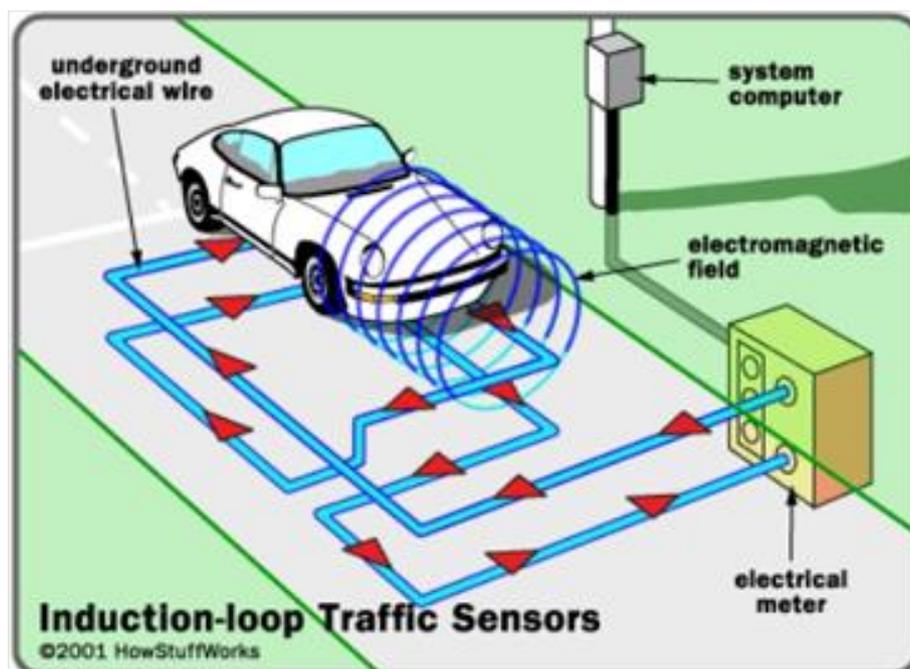
Figure 6. Basic Loop Metal Detector Concept

By using the rules of figure 6 and figure 7, you can create the final range (design) of the Automatic Portal system. So that the size of the Loop Metal Detector area is around 4250mm x 2000mm, this is taken from the length of the Avanza car added to the width of the Barrier Gate side with a rounding value of 4250mm from the previous value of about 4230mm and the width of the Avanza car with a rounding value of 2000mm from the previous value of 1660mm. (design) the end of the study as illustrated in Figure 7.

After we get the metal detector area, then the final part of this research is to place the Loop Metal Detector in the Metal Detector area as seen in Figure 8 with a size of 4250mm x 2000mm which is estimated in red.
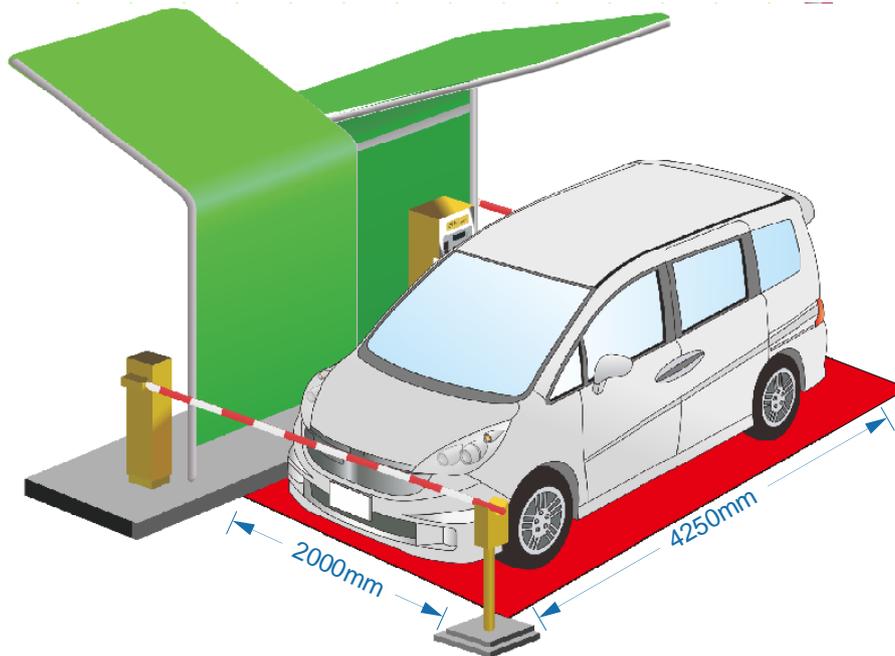
Figure 7. Final results of the study

4.   Conclusion

By implementing appropriate technology, security systems can be created such as automatic portal systems that can anticipate crime rates, especially in residential complex environments. Test results and calculations using the Avanza car specification table and manual parking system book can be made an automatic portal system design, the system area used is around 2000mm x 4250mm, this is obtained from the length, width and height of Avanza cars with dimensions around 4200mm x 1660mm x 1695mm. The distance of the front of the Avanza car with steering is used to determine the distance between the parking bar and the parking system and the height of the Avanza car is used to determine the location of the RFID reader placed in the location of the parking system.

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