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Motion sensing and Image Capturing based Smart Door System on Android Platform

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***Abstract*—A smart door system which can be controlled by the android application installed on smart phone is proposed in this paper. Earlier, smart locks were used which enhanced the security features of the house. The proposed model can eliminate the concept of lock system as here the security is provided to the door itself. This would result in a safe and secure door with no locks! Controlling the movement of the door is enabled by Raspberry pi and its related embedded software. Also merging IOT with android is has many advantages in terms of security. The motion sensors are used to detect any movement in front of the door. If any person comes in front of the door, a motion is triggered; the image is captured and notified to the owner. Thus in overall proposed system, two technologies are concentrated on, one is motion sensing in the front of the door in real time even if there is no one at home and the second is to control the movement of the door by the smart phone. Thus by connecting a mobile phone to a door, the owner get notified whenever any visitor visits his home and looking up to the images, the owner of the home can send the open door signal for only the trusted visitors.**

Keywords*— *Motion Sensing, Safety ad Security, Image capturing and notification, Smart Door System

I. INTRODUCTION

As IOT is gaining lots and lots of popularity, we can control any configured device in the home and can operate it remotely. This is very much advantageous. Many companies are striving hard to develop many efficient home automation devices. Thus, IOT has taken market by storm. Also there will be huge progress in the field of home automation development in near future. To make Smart Home system, we mainly concentrate on two core technologies. One is Internet Of Things which enables internetworking of the devices and the second is the concept of machine learning where the device itself can predict the next state according to the historical data. In our paper we have shown a communication of a door with its owner. Motion sensing, image capturing instant message notification is handled by camera. All the data that is generated is stored in cloud storage. Thus all the processing and control is done in cloud.

II. OVERVIEW

A. Existing Systems

Advent of IOT has led to much advancement in the field of home automation. Many devices can be controlled by controlled in many ways. One best way that is currently being developed is controlling the devices in home by chatting software [1]. This is as similar to a person is chatting with other person. The lock system is also controlled by mobile devices. There are many types of digitals locks available in the market which is more secure. Many of them work on different on cryptographic algorithms, digital signatures and so on.One best locking system is a smart lock with Wi-Fi security [2].

With the increase in issues related to security and safety, the home automation and smart home devices are gaining lots of appreciation. Nowadays a door is not just a wooden piece or wooden block that can be opened or closed manually to enter or exit, but in the current generation a door is technically a medium to let only genuine users to let enter the home and keeps intruders away from home and don't let them enter. Thus the door itself provides security. The security is provided by different electronic means such as digital locks, facial recognising, and fingerprint scanning and matching, audio/video recognising, SMS/MMS – basedsmart doors and so on. Real time smart door system which works based on SMS and audio message notification [3] is also widely used.

A smart door is also known as Intelligent door which works on the basis of digital code, passwords, scanning and recognising factors such as fingerprint scan, eye scan or retina scan. A smart door not just opens or shuts when user commands but also keeps track of its surrounding environment. It also detects any foreign bodies entering or passing in its area diameter. Also a log entry is maintained that saves the entry time interval and many other related information that will be helpful in keeping track of the persons who visit the home. Thus a form of registry is created.

Programmed automatic entry/exit door control is very much common today. They are a part of places like shopping stores, grocery stores, airports, shopping malls, business buildings, and transportation stations and so on. The establishment of these doors wipe out the need of manually or physically opening and shutting the door activities. Contemporary sensors] based programming or automatic door control innovations use infrared/radio/ultrasound or different remote detecting strategies. These can be further classified into passive and active methodologies. The active procedure emanate infrared signal from the controller and catches the reflected signal to decide whether there is any object near the door. High cost has made this method less prominent. The

passive approach identifies the infrared sign emanated by the individual and is broadly utilized for being straightforward and less cost. The ultrasound/radio approach produces the ultrasound/radio waves to examine the environment and returns the signal for door access and control.

Despite the fact that these systems are effective in detecting the objects, they are not capable of understanding the sort and goal of items. For example, a cat or a passing person may accidently trigger the door and can cause false opening activity. Frequently false activities are not just irritating but additionally diminishes hardware lifetime. Thus this requires a need for programmed door control framework in view of detecting and analyzing individuals.

Also there are other automated smart door systems but they work completely on signal generation and processing. Some smart doors can be controlled by their own remote control. This approach is also has many drawbacks. One important drawback is the range factor, where the user has to be in range or near to the door to operate the door. Also if the remote is lost or tampered, the entire system becomes inaccessible.

In this paper, door control depends on the affirmation that the detected subject to sure a human the corresponding Trajectory shows that he/she has the intension for a passage. The image is captured and sent to the owner and upon seeing the images, the owner can decide whether to open the door or not. Here we have developed an android application that enables easy way of performing the overall operations.

B. Aim

The aims of the overall system developed are as follows:

Using the rapidly developing IOT and machine learning advancement that offer intelligent cloud solution for building up versatile doors.

Providing a user friendly and innovative dedicated android application where in which the user can control the door through their android smart phone.

Provide a innovative way of door system where the owner can access the doors with their mobile phones.

Bringing the features of IOT on android platform.

For the incoming image information and all the related data is stored in cloud.

Notification of the actions distinguished by the client with inherent motion sensors.

Smart door framework conveys a very different point of view to open environment management along with internal management along with internal management framework administration.

C. Proposed System

In this paper, we have tried to build up another arrangement in the intelligent door system for a few and correspondence issues. The architecture will have accompanying applications:

Provides a framework including hardware, mobile computing, software and distributed computing makes the combination of a complex architectural structure.

Unlike the existing frameworks, this framework has image capturing to distinguish the individual who tries to get in the range of the house and the caution is transmitted to the owner of the house.

Text to speech highlight are creative element added to this framework. We plan to have a venture in cutting edge smart door security frameworks.

Image will be recorded in the cloud storage for later utilization. In this way the imperative information will be held in the cloud for checking the information later.

Another critical issue is to give security in the framework that other persons can't get to the architecture. Subsequently, encryption will be used between cell phones and savvy door framework, cloud and smart door framework the other way around. Along these lines, the information is ensured.

The framework will be incorporated on an implemented framework device called Raspberry Pi. The device will have camera, sensors as shown in figure 1. Keeping on mind the main goal to give correspondence between keen door framework and cell phone, we have used APN innovations. Other than this, the framework will give sms informing transmission between smart door framework and cell phone if a guest can't achieve the owner of the house and other way around.

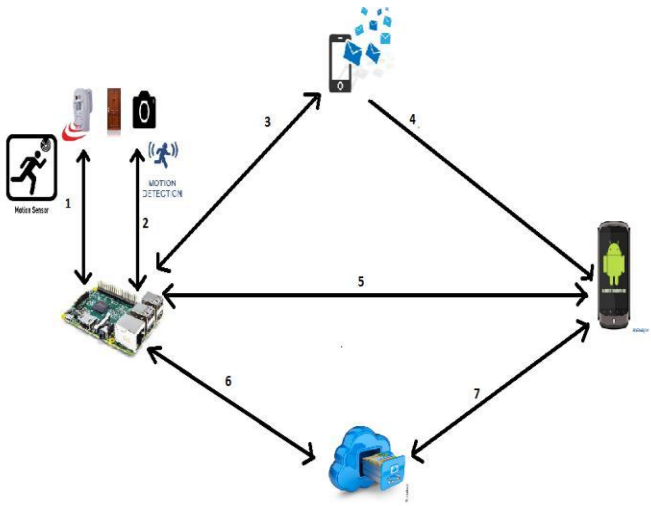

Figure 1: Proposed System

III. OVERALL DESIGN CONCEPTS

The proposed smart door framework is principally based on human detection and intention analysis. The initial segment includes face recognition through the image captured by the camera or foam location that recognises whether the detected subject is a human, while the last incorporated direction following and factual examination for intension estimation. A flow chart of the control strategies is shown in Figure 1.

It is solely the owner, who decides whether to open the door or not. Upon receiving the image from the camera, the owner, on his/her mobile phone can send the open/shut signal to the door. The recognition of human behaviour is subsequently useful. To put it plainly once a man is distinguished in the Region of Interest (ROI), the trajectory oh his/her face is followed by the analyzer to compute the comparing combined likelihood, and will be utilized as a estimation of the intention.

Then again, the door closing system as shown in Figure 1, the door automatically closes if no subject is detected in the section of the front side of the door. If the owner sends the open signal, the door opens accordingly and after a certain amount of time, when the time stamp expires the door is closed automatically. In general procedures of the state move, Human discovery, intension examination and the hypothetical performance assessment are depicted in the following subsections.

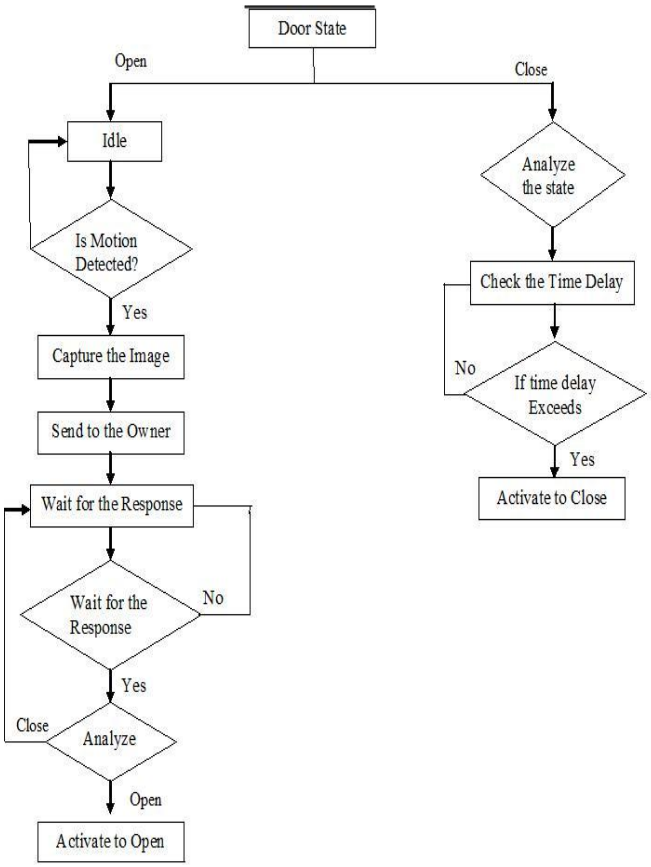

Figure 2:Flow Chart of the overall System

A. Motion detection or sensing

Motion can be detected in many different ways. For example, infrared rays, by sound or vibration. Motion detectors are primarily utilized for distinguishing moving objects with respect to the position, increasing speed and acceleration. Motion sensors are widely used in many fields. We use motion detector to detect the presence of any person in front of the door.

Basically all motion detector use infrared radiation for movement sensing. The sensor gives the information about motion with which the device can alarm the owner to perform the next task.

B. Android

Everyone uses a mobile phone. Mobile which has android are known to be smart phones. Using android as an operating system one can develop many useful mobile applications.

In this paper we have tried to bring the advantages of motion sensing into the android platform. We are trying to develop an application that is dedicated for controlling the movement of the door only. Thus this results in a smart door framework with android platform.

This application facilitates user to receive the notification from raspberry pi, upon looking to the notification, the user can press on open/close buttons provided in that application. Upon pressing the open button, it signals raspberry pi that the user wants to open the door which in turn signals the motor attached to the door. When open signal is triggered, the motor attached to the door activated and produced pull action which opens the door.

IV. CONCLUSION

In this paper, an automatic door control framework is executed on an android platform. We have proposed an arrangement of efficient way to give correspondence amongst customers and home security. Keeping in mind the end goal to give a powerful architecture, this is coordinated on door of the house. The framework depends on the captured image which is exceptionally prominent innovation for giving security and wellbeing in many urban areas. The main purpose of using Raspberry Pi is it is a solid and dependable installed architectural device for illuminating unpredictable and testing errands. Utilizing both (motion sensing and image capturing) innovations in the architecture gives different advantages to build the proficiency regarding correspondence among the guest and the owner of the house and also wellbeing of home.

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