An IoT & AWS Based Smart Door Authentication System for Securing Hospital Maternity Wards

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Abstract

Security and accessibility is the main concern in today's world. Today, is there Any safety for maternity wards? As we know that, the security measures are taken by hospital management such as an identification band system for new born babies and their parents, as well as requiring all staff to wear ID badges, even some hospitals are providing high tighten security to the maternity wards. The precious new born babies are snatched from the hospital or are sent home with someone else by mistake. I am going to propose a system which provides security to the maternity wards. Smart door lock which can recognize a person, greet the person with name and remember an unknown guest. At the admitted stage, the receptionist takes the details of parent along with their photo. These photos are uploaded to the database. Smart door lock captures the face by guessing the parent, if it matches then it will allow the parent into the maternity wards. These all operations are done by Alexa. Smart door lock system can useful to all maternity wards.

Keywords - *AWS S3,SNS, DynamoDB, AWS ,AWS Lambda.*

I. INTRODUCTION

In day to day life security of any object, place or person are playing an important role especially there is no safety for maternity wards, moving beyond the standard precautions – such as an identification band system[2] for new-borns and their parents, as well as requiring all staff to wear ID badges – some maternity wards are going high tech to further tighten security. Even though, the precious new-born babies are snatched from the hospital are sent home with someone else by mistake. These types of situations were happened in previous years and continuing. Some Government or Private hospitals do not provide minimum security in India. As per news, nearly three hundred eleven kids are missing from the hospitals; moreover this count is gradually increasing day by day.

The main aim of this paper is to solve one of the security issues prevailing in the present society. It has been very difficult for people to have better security solutions even though in the improved technological situations[4]. Various systems have already been proposed in the field of security using different technologies. All the previous systems lacked wide range of accessibility.

in this paper we are proposing a concept called a Smart door lock[3] for maternity wards which can recognize a person, greet the person with name. At the admitted stage, the receptionist takes the entire details of parent along with their photo. These photos are uploaded to the database. Smart door lock captures[6] the face by guessing the parent, if it matches then it will allow the parent into the maternity wards. These all operations are done by virtual assistant developed by Amazon called Amazon Alexa[7][8] with this we can take support from an Amazon online web services and functions which can provide a security to the system. If any unauthorised person try to access it will not allow them into the maternity ward. Smart door lock system[6] can useful to all maternity wards . Such that the system can provides security to the maternity wards. The main advantage is it's user friendly to control the locking system. The aim of this paper is to provide a security solution allowing the user to rely on a technical solution for the safety.

An incident that happened sometime back at a hospital. This describes how an attempted child abduction was foiled by hospital security with the help of infant wearable monitoring system[9].

Child abduction attempts and other mishaps in hospital infant wards, unfortunately, are not rare occurrences. Newborns, the most vulnerable of all the people in a hospital, are prone to some major security threats in the maternity ward, which sometimes are not properly taken care off – the risk of infants getting stolen or sometimes even getting interchanged. Incidents where immediate medical attention was delayed because staff were not notified when certain

critical conditions like body temperature, heart rate etc. varies abnormally also adds to the disaster list[9].

Thanks to ever evolving wearable IoT technologies, newborn babies can now be tracked and monitored right from the birth. There are multiple products available that will safeguard newborn babies from abduction or any unwanted movement in hospitals.

A. Movement tracking and Security

Hospital staff can pre-load these solutions with an area that the newborns are supposed to be carried around inside the hospital. Whenever movement is detected outside this geofenced boundary[9], the solution instantly alerts security about this so that corrective actions can be taken. Besides just alerts, automatic preventive actions can be programed such as disabling the elevators or shutting the exit doors.

B. More than just location tracking

Now with the right wearable technology in place, much more can be accomplished with this solution than just location tracking and monitoring. By introducing additional sensor capabilities to this platform, parents or hospital can measure and track the newborn's heart rate, temperature, rollovers, sounds etc. Similar to movement alerts, notifications can be programmed when any of these shows abnormal characteristics.

One of the most critical factors that will decide the mass adoption of this technology would be the convenience factor of the wearable sensors as well as gaining new parents' confidence to attach these wearable or sensor tags to their newborns.

Accuracy and consistency of monitoring will also play a key role in successful implementations
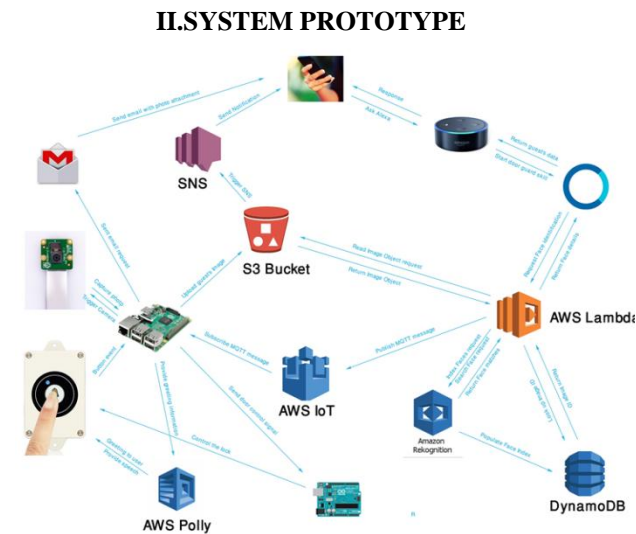
II.SYSTEM PROTOTYPE

Figure 1.1 system working prototype[3]

The following are the steps involved in the system which are explained in **figure 1.1**

1. Smart door lock for maternity wards which can recognize a person, greet the person with name. At the admitted stage, the receptionist takes the details of parent along with their photo.
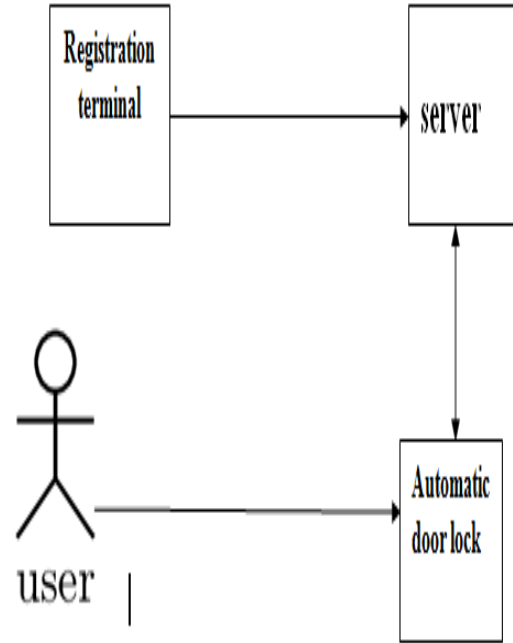2. These photos are uploaded to the database[4].

Figure 1.2 Registration Process

3. Raspberry pi with camera module takes a picture of the person and upload it to AWS S3 Bucket and Bucket trigger a SNS Notification[1].
4. It sends an email with the photo to the receptionist.
5. It sends a greeting text to AWS Polly[8] and then play the audio greeting for the person returned by the Polly.
6. After getting the notification from AWS SNS can ask Alexa to introduce the guest by invoking the custom skill "Door Guard" and saying: Alexa[6], ask door guard who came?
7. Alexa triggers a Lambda Function and Lambda function does the following jobs:
   a) Read the image uploaded to the S3 Bucket.
   b) Sends a face search request for the image to AWS Recognition[7].
   c) After getting face matches result return by Recognition, Lambda search for the name to AWS DynamoDB[3][5] and return the name to the Alexa.

d) Alexa provides the name to the receptionist and again call the Alexa to open the door for the person.

III.TECHNOLOGIES CONSIDERED FOR IMPLEMENTATION

The following are the two main technologies we can use to implement this prototype

A. Python
B. Amazon online web services

A. Python

This python code snippet captures a photo, upload it to S3 bucket, sent the photo to your email address with a notification, receives message from AWS IoT[3] and sends command to Arduino and produce the greeting message for the outsider.

B. Amazon online Web Services
➢ It provides an inbuilt user interface to perform AWS tasks like working with Amazon S3 Buckets, launching and connecting to Amazon EC2 instances[8], setting Amazon Cloud Watch alarms, etc.
➢ The AWS Console provided by Amazon Web services[4], allows its users to view resources for select services and limited set of management functions for select resource types.

1. How to use AWS
Following are the steps to access AWS Services-
➢ Create an AWS account.
➢ Sign-up for AWS services.
➢ Create your password and access your account credentials.
➢ Activate your services in credits section.
By using above we create the AWS account and can make use of all Amazon Web online services.
The following AWS functions we can use for implementing this system
Raspberry Pi[6] with official camera module and an Arduino[3] with a servomotor for controlling the lock.

➢ AWS S3 Bucket
➢ AWS SNS Notification
➢ AWS Polly
➢ AWS Lambda
➢ AWS DynamoDB

2. AWS S3 Bucket:

➢ S3 stands for simple storage service.

➢ An Amazon S3 Bucket[4] is a public cloud storage resource available Amazon Web services(AWS) simple storage service, an object storage offering. Amazon S3 Bucket, which are similar to file folders, store objects, which consist of data and its descriptive metadata.

3. AWS SNS Notification:

➢ Amazon simple Notification Service Documentation[2]. Amazon SNS is a web service that enables applications, end-users, and devices to instantly send and receive notifications from the cloud

4. AWS Polly:

➢ Amazon Polly is a cloud service that converts text into lifelike speech[1].

➢ Amazon Polly supports multiple languages and includes a variety of lifelike voices, so you can build speech-enabled application that work in multiple locations and use the ideal voice for your users.

5. AWS Rekognition:

➢ Amazon Rekognition[7] is a service that makes it easy to add powerful visual analysis to your applications.

➢ Rekognition Image is an image recognition service that detects objects, scenes, faces and identifies inappropriate content in images.

6. AWS Lambda:

➢ AWS Lambda[8] is an event -driven, server less computing platform provided by Amazon as a part of the Amazon Web Services.

➢ It is a computing service that runs code in response to events and automatically manages the computing resources required by that code.

7. AWS DynamoDB:

➢ Amazon DynamoDB[5] also known as Dynamo Database or DDB – is a fully managed NoSQL database service provided by Amazon web services

➢ An AWS user interacts with the service by using the AWS Management console or a DynamoDB API.

IV.INNOVATIONS IN MATERNITY CARE

Areas of particular focus are improving safety and reducing harm, and improving patient experience of care, for women and their families. The following are the four projects, all recipients of Health Foundation support, have found innovative ways to do.

A. MaternityPEARLS – internet-based training package:

MaternityPEARLS is a web-based learning package for practitioners carrying out medical procedures on women with perineal injury sustained during childbirth. It has now been adopted by two royal colleges as part of their online learning programmes. Developed by the University Hospital North Staffordshire NHS Trust, MaternityPEARLS[10] aimed to reduce morbidity associated with childbirth-related perinea trauma, and to improve women's experience of maternity care. The team built on the PEARLS national clinical quality improvement initiative which improved implementation of evidence-based guidelines for the management of childbirth-related perineal trauma.

B. The My Birthplace app

My Birthplace, an app that helps pregnant women and their partners decide where they would rather have their baby, has led to more effective workforce and resource planning as a result of faster decision-making by parents.
Portsmouth Hospitals NHS[10] Trust developed this computerized decision-making tool to help pregnant women and their partners to choose whether they would prefer to have their baby on a hospital labor ward, in a midwife-led unit or at home

C. PROCEED pre-pregnancy care in diabetes

The innovative PROCEED[10] model of community-based pre-pregnancy care for women with diabetes, resulted in improved effectiveness, efficiency and timeliness of pre-pregnancy care for women with diabetes, reducing the average waiting time from 13 to five weeks.
Led by Derby Hospitals NHS Foundation Trust, the PROCEED project succeeded in reducing the percentage of babies stillborn to mothers with diabetes from 6% to 0%, and delivered a financial saving of £60,000 in its first year.

D. PROMPT Course in a Box

The 'PROMPT Course in a Box' [10]is a multi-professional obstetric training programme which reduces preventable harm during emergencies in childbirth. Since its roll-out, PROMPT has been associated with improved knowledge, communication, team-working and direct improvements in perinatal outcome, and has now been adopted by most maternity units in the UK.
Developed by a team at Southmead Hospital in Bristol[10], the box contains manuals and all the multimedia materials needed to run the course, making PROMPT easily shared with other maternity units who want to use it.

V. CONCLUSION AND FUTURE WORK

The Smart door lock for maternity wards could run properly and stably. It could implement all the designed and needed features and functions. This could be achieved only by proper software and hardware development, as well as multiple test and debug procedures. All the instructed functions were implemented in the system: performs their tasks according to the notifications. For an improved, effective system to be implemented and achieved, the suggestions should be considered for further work. The smart door lock for maternity wards provides security. The unauthenticated persons won't allow into the ward. If an unauthenticated person attempted to open a smart door lock the system send an emergency alert to the hospital management. The Smart door lock for maternity wards could run properly and stably. It could implement all the designed and needed features and functions. In future, the functions and authentication process can be modified and can add advancements by using Amazon online web services.

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