REAL-TIME PROXIMITY AND HEALTH MONITORING-cum-ALERT SYSTEM WITH ML-ENABLED PREDICTING MODEL

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Abstract : The main objective of this project is to help Doctors (or) Supervisors remotely monitor the Condition of the ambiance, Health condition, and the proximity from the set location of a Patient (or) Person under observation. This project imbibes the concept of the Internet of Things (IoT) and so the data is accessible seamlessly even if the supervisor is remote. Using range detection techniques and health parameters, Manipulations are done in the backend such that the alerts are notified based on set conditions to the respective person in case of emergency, we can conclusively predict the condition of a Patient (or) Person under observation remotely and accurately. Further, the data received from a patient is integrated into the database for analytics in Machine Learning (ML) to predict the reaction of another patient who suffers from the same disease or condition in the future. In addition, the product is feasible to be designed as a Handy and User-Friendly prototype, Cost-Efficient model, Less power-consuming mechanism, and Alterable Design.
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Keywords - Internet of Things (IoT)**.** Machine Learning (ML)**,** Health parameters

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I. INTRODUCTION

In the health sector, Because of its direct impact on life, Doctors need to follow a lot of precautions, thereby abiding by safety measures is obvious. Taking this as motivation, Frequent problems that Hospitals face is during the observation of a patient (or) monitoring the health status of the patients regularly. The possibilities are resolved into three cases and the solution is envisioned as a smart yet affordable one. The plan is to develop a technology-based device for Kids, Senior citizens, especially differently-abled individuals, or anyone who needs supervision in such a way that it can alarm the concerned person in case the person who needs supervision is crossing a specified boundary or his/her health condition turns adverse. The solution is centered around the field of Internet of Technologies (IoT) and Machine Learning (ML) and the scope is viable in the domain of Smart Home, Security and Authentication, Automation, Data Science and Machine Learning, Data analytics

II. RESEARCH AREA

The research area of this project concerns is healthcare and smart automation. The domain of technologies employed for this project is the Internet of things (IoT) and Deep Learning to facilitate the user with a sophisticated model/Prototype, accurate prediction for their respective application. The possibilities/ Problematic factors are resolved into three cases and the solution is envisioned as a smart yet affordable model which hospitals and people opt to employ for their wards or in their homes. The key idea is to develop a technology-based solution for Kids, Senior citizens, especially differently-abled individuals, or anyone who needs supervision.

III. MOTIVATION AND SIGNIFICANCE OF WORK

The motivations were observed from multiple difficulties which are being faced by hospitals on daily basis. When planning, the cases have been resolved for two different applications. They are,

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A) Hospital Application
  i. In recent years, we have seen a lot of patients missing from hospitals when they are in treatment due to the misconception of COVID-19.
  ii. Special and constant care is always needed for mentally unstable patients as they are prone to be absconded from their wards.
  iii. In some hospitals due to lack of security, we see newborn babies being kidnapped.
  iv. Due to insufficient Doctors, nurses or workers, there is a compromise in timely check for each patient which further brings a big threat to the lives of patients.
  B)   Home Applications
  i. Aged people definitely need strict supervision.
  ii. Monitoring Babies while WFH became a tedious task to many housewives in recent days.

IV. CATEGORIZATION OF CASES

By Research, the patients are categorized into two types. (A) Immobile patients, (B) Mobile and mentally unstable patients. The mandatory services for both (A)and (B) patients are SpO2 cum Heart rate monitoring, Accelerometer Module for motion capture, Temperature, and Humidity Sensor for monitoring Room Condition. The purpose of Bluetooth exclusively lies in keeping track of limits set to type (B) users as there are possibilities for them to be missing.

V. PROTOTYPE DESIGN

The prototype design structure is split into three parts. The prototype (Raspberry pi/ ESP32) with the patient under observation(i), Prototype fixed by the Doctor within the boundary (in proximity to the patient) (ii), A monitoring device (i.e., PC/iOS/Android Application) (iii). SpO2 sensor cum Heart rate sensor and Bluetooth are interfaced with (i)module, Accelerometer Module for motion capture, Temperature, and Humidity Sensor for monitoring Room Condition and Bluetooth are interfaced with (ii)module. Both the split prototypes are connected to the user Internet and data is received simultaneously in the USER END (iii). The dimension of working is as a whole receiving data given by the sensors and is displayed for alarming the doctors and for boundary monitoring, we use Bluetooth signal as a key by sensing the distance between the Bluetooth modules of the prototype (i) and (ii).

VI. PARAMETER BASED ALERT CASES

The alert cases that the supervisor receives are when the person under supervision/ Patient i) Moves above the set distance. ii) SpO2 /Heart Rate/Body Temperature is undesirable. iii): Room Temperature /Room Humidity is undesirable. iv)Motion (For necessary Observations).
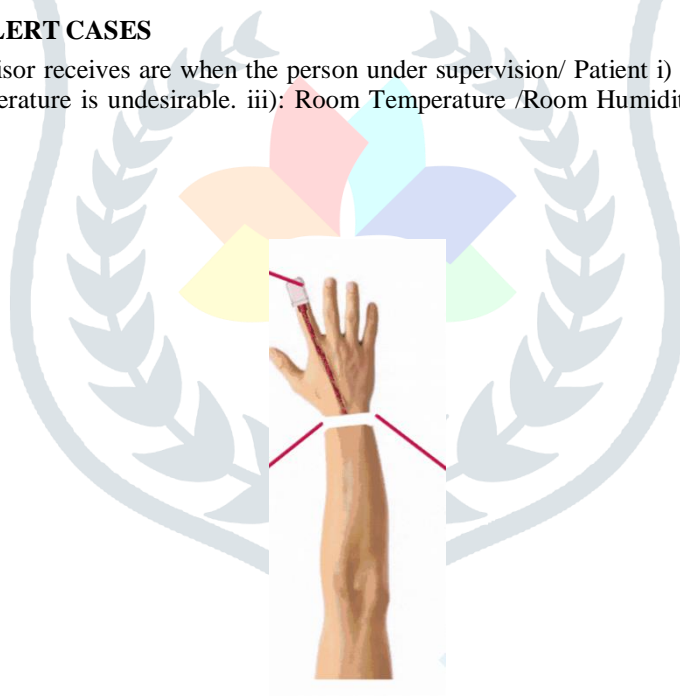
VII. Model

Figure1. Prototype with patient

The block diagram depicted in Fig. 1 shows the prototype which is tied to the patient/ Person under supervision. This part collects the data for health parameter observation. And this acts as the master and is in constant communication with the slave device i.e., Prototype placed by the supervisor in Fig.2.
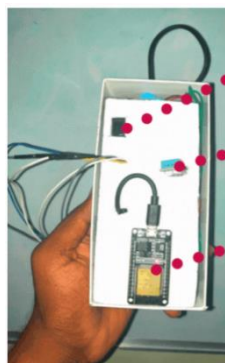

Figure.2 Prototype placed by supervisor

The block diagram depicted in Fig. 2 shows the prototype which is placed in proximity to the patient/ Person under supervision. This part collects the data for Ambience prediction and movement prediction. This acts as a slave device to send the acknowledgment to the master.

And as a whole, the two parts are connected to the internet such that the data is stored for monitoring, alerting, and processing.

VIII. DEEP LEARNING PREDICTION

Figure.5 Patient Database

The data which are collected while monitoring the patient is stored in a database (SQL/ Firebase) and these data are further processed with a Machine learning model to predict the condition of another patient with similar ailments and provide the result of what would be the survival rate, the health condition in the process of undergoing treatment, and possible movement of the person under test

IX. CONCLUSIONS

Thus, A technology-based solution for Kids, Senior citizens, especially differently-abled individuals, or anyone who needs supervision is developed in such a way that it can alarm the concerned person in case the person who needs supervision is crossing a specified boundary or his/her health condition turns adverse. The solution is centered around the field of Internet of Technologies (IoT) and Deep Learning (DL), and the scope is viable in the domain of Smart Home, Security and Authentication, Automation, Data Science and Machine Learning, Data analytics.

X. ACKNOWLEDGMENT

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