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Health Care Application System using IOT

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Abstract: In-home healthcare services based on the Internet-of-Things (IoT) have great business potential. In this paper, an intelligent home-based platform, the Health-IoT, is proposed and implemented. In particular, the platform involves an open-platform-based intelligent medicine box (Med-Box) with enhanced connectivity and interchange ability for the integration of devices and services. Flexible and wearable bio-medical sensor like heart rate and temperature, ECG sensor etc. are incorporated in this. The proposed platform seamlessly fuses IoT devices with in-home healthcare. Services for an improved user experience and service efficiency. The feasibility of the implemented Health-IoT platform has been proven in field trials. Medicine box and the wearable sensors are connected to Server via an Android based smart phone through Bluetooth, which has an interface for the patient to see his medicine conception and health status the remotely connected web page is operated from hospital which has provision for giving prescription and views all patients consultation details and test details consulted doctors etc. The Medicine conception details and alert are given to mobile app via this website with is connected through the internet, If the patient forgot to take medicine or taken a wrong one which can be alerted through the app. And here discussed how to implement in the real world system. Analyze system capacity by testing devices and modules.

Keywords: Health-IoT, intelligent medicine box (MedBox). Services: Android, PHP, and Embedded System-Hardware Unit.

I. INTRODUCTION

Health care device using IoT aims at developing an IoT based software model along with a device to analyze and evaluate the health conditions of a person and verify the prescriptions related to an old age patient. A patient can communicate with a doctor via software. Software phase will be provided with a website as well as an Android application. The user will be able to communicate with the software and necessary data required for the response will be provided using the device by analyzing the different factors regarding a person's health such ass pulse, ECG, heartbeat etc. The relationship between the hardware and software modules will be based on Internet of Things. The responses from the software by real time dialogue (chat).in web site through the mail. Sensor unit monitors all features of the body, the hardware part will be controlled by a controller data controlled by controller it will connect with the app by a Bluetooth module and then connected to a PHP website. Website contains a database as server and app will contain all data as a local database. The Internet of Things (IoT) is an environment in which for transfer data over the network. IoT can evolve from coverage of wireless technologies. And here developed IoT based health care application system is useful for hospital management system and here compared the efficiency accuracy and time to consume with a manual process and implemented to develop a short model then it will be enhanced in future. This paper refers the detailed study of the system with a manual process and understands future enhancement. This cloud based computational process will be helpful for hospital management system by using IoT and the hardware, software modules, this simple architecture created by analyzing this paper and cloud based implantation in progress. It is more feasible to easier the consultation and prescription of medicine, mostly this system applicable for old age people who cannot come to the hospital. Analyze all features of the system in this paper. In this paper simply explain the simple architecture of smart hospital management system worked for a single patient.

II. HEALTH CARE IOT SYSTEM

Nowadays a number of hospital sites are available, in the existing system there is plenty of hospital sites are exist now. Here manually enter the count value of health condition test. And it has not a proper indication. In the proposed system Health condition test value update automatically through sensors. Medicine box setup handles the patient taking the proper medicine at the correct time.provide communication by chat.Here exist Separate registration and update. Communication is provided by Doctor and patient through website and android application.Here the other functions are Control the prescription and details, Access database easily, View all details, separate login, Connection established by Bluetooth. Cloud based communication used for storing or exchange data. Sensors mainly used here as LM35 as a temperature sensor, HB1 as heart beat sensor and fault detection sensor ECG etc. are used. This is the simple system visualization. Here the system is induced for single patient enhanced in real world application by the cloud based system using IoT.

III. REQUIREMENT ANALYSIS

This phase is for understanding what all are the improvements needed by the user for overcoming the drawbacks of the current system. This will develop an automated system by solving the problem of requirements. Based user expects and need we are collect data and modified the system as required one. The android interface manages the login details it also has access rights.The android app provides interface of communication and visualisation to the user by a small local database access.Bluetooth connectivity provided for connection between hardware units with a smart phone. The web interface manages the registration and login details of the patient it also keeps a list of patients and doctors who are in turn using the service. Hardware unit required PIC controller (PIC16F877A), Bluetooth module and Sensor unit used as Heart beat sensor, fall detection sensor, Temperature sensor, ECG sensor, these are the requirements of health care system. We can enhance the requirement of sensors based on their needs. And place there on featured disease oriented sensors for here .this implanted system worked with 4 sensors as a demonstration model for future. Automatically controlled sensing of health status and proper medicine indications as well as other hospital controlled feature include the help of android app and website. The above requirements are analysed and confirmed and check feasibilities and advancement are processed.

IV. PROPOSED ARCHITECTURE

A. Hardware Unit

This is the proposed architecture of embedded system/ hardware unit used in the whole system. Hardware unit in the simple system working for one patient as created now and enhanced to everyone as a wearable format. Here the simple system consists of a micro-controller unit as PIC16F877A.with sensor for fault detection, ECG, temperature sensor heart beat sensor and single pic can connect 8 sensors and the additional pic will enhance the sensor capability.as a demonstration only use 4 sensors. Sensors are devices that detect or measure physical properties and records, indicates or otherwise respond to it micro controller is a computer present in a single integrated circuit which is dedicated to perform one task and execute one specific application. Bluetooth is a standard for short range wireless communication of cellular phones, computers, and other electronic devices.

Data collection is performed in this system with the help of sensors. Here the sensor values are the data I the system. The analogue data values from the sensors are converted to digital by the analogue to digital converter (ADC) of the microcontroller. The microcontroller has 8 ADC pins and 8 analogue sensors at a time. The microcontroller has A, B, C, D, E ports out of this ports A and E are ADC ports. LM35 as a temperature sensor with less self-heating capacity output is linearly proportional to Celsius values. And enhanced by other accurately sensing devices with high cost will be adopted for this system. Read sensor values stored in the database and displayed. In heart beat sensor transmitted IR light and transmit from sender to receptor by taking the value of heart beat from the tip of a finger, the rate at which lights are transmitted will be calculated as heart beat value. Accelerometer or fault detection sensor detects patient fall/equipment fall etc. ECG based sensor take electro cardio gram output as voltage value if it is high patient feel sick otherwise no problem .these are the working of modelled hardware unit functions. This can enhance future as a wearable device, and sensor capacity the communication with hardware and software part now implemented in Bluetooth .it will work in low distance area and enhanced its Wi-Fi connectivity. Update health condition values automatically through sensors, read the sensor values stored in a database stored and retrieve data from it. Here 3 medicine box setup is used for proper medicine intake of at morning, afternoon and at the night and provide proper LCD indication and alarm as well as app indication also provide.

Here the software part consists of 2 modules Android application and a PHP website. Android application controls all indications. Here the prescription details and other data values are stored in the local database and choose medicine indication and sensor indication controlled appropriately by the application. Chat implementation and leave appointments and functions of hospital system communication mainly controlled by this app.

Website communication controlled by Email. Prescription details stored in database here database act as server database here will implement the cloud based server in future. And the system will update prescription. Admin will control doctor's appointment and other updating. The hardware unit and phone or app connected to Bluetooth and system connected by the Internet. System enhanced as cloud based network.

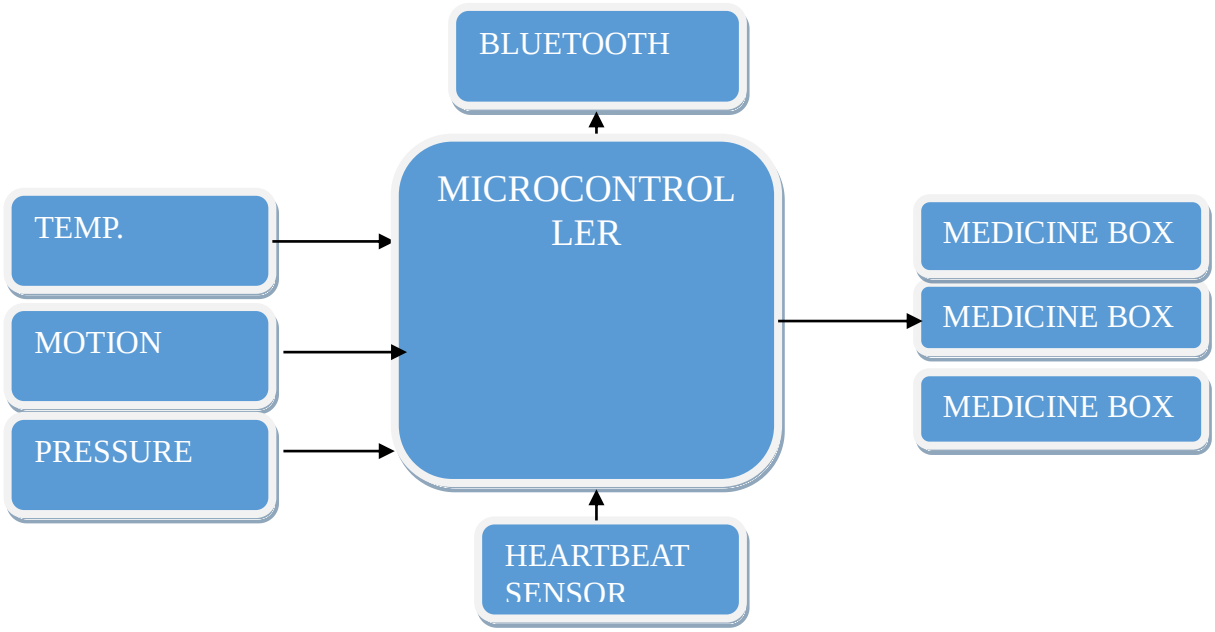

Figure 1: Sample Model of Hardware Unit of Health Care IOT System

Fig 1 referees hardware and medicine box setup. And it will enhance in future and fig 2 refers the software setup and connection established by Bluetooth module.

B. *Software Unit*

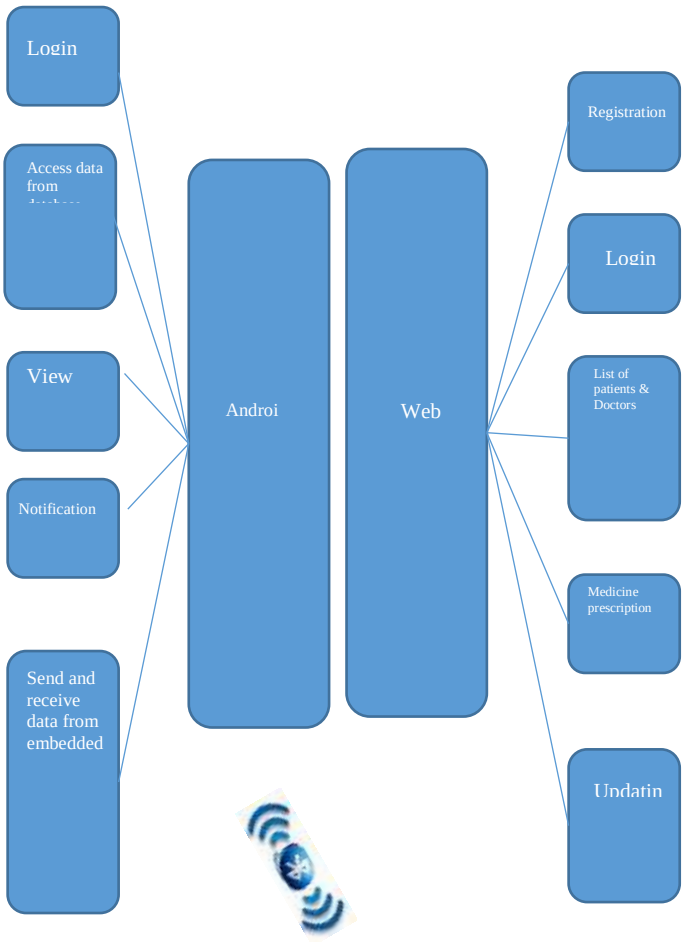

Figure 2: Sample Model of Software Unit Of Health Care IOT System

V. PROBLEM DEFINITION

The existing system for analysing the health conditions of a patient is not efficiently computerized. There is no existing system based internet of things as well as the cloud based system. The existing system not at all. Problem is for developing such a system to overcome the existing system drawbacks and enhanced in future, based on small innervation. Network feasibility enhanced on proposed system is by the android app and PHP website and health conditions and proper medicine take by medicine box and sensor unit based hardware unit. Create a sample system for a single patient first then enhanced the system in real world hospital management system by cloud based using IoT.

VI. SYSTEM DESIGN

There are mainly 3 modules for this system, Website PHP, Android app (doctor& patient), hardware unit. Both act as a software module. Here in website consist of different application. There consist of the home page for registration, separate login for doctor and administrator. Admin does some operations as add patient, medicine management, and also manage doctors and patient details as well as medical history. Doctor's page created in the website for the view and manage patient appointment. Android application designed for the user as a patient, and for the doctor. Patient app induced for booking appointment, chat with the doctor, prescription details handle, sensor value viewing and alert for all functions. Doctor's app takes role are leave marking, chat with the patient, mange patient details well as prescription, monitor all sensor values, also alert to doctors will take place Here also contain in both app the details of prescription, view authorized data and login page also accesses data from the database. Hardware unit of the system has mainly two parts one is medicine box set up and other is sensor unit. Sensor takes health condition status and update it. Controlled the hardware system by a PIC. The medicine box setup intakes proper medicine as the morning, after noon and night with proper indication and alarm and LCD display. Data transfer by USART-universal synchronous asynchronous receiver transmitter based Bluetooth protocol is used. The controller is 40 pin IC. It has 33input –output pins 25 are used for digital applications others are used for the analog application. The main database located at distinct network location the Bluetooth module in hardware unit is paired with phone and data uploaded with the server via internet connection available in the mobile phone. Data visualized in database as tabular form, as normal database manner.

When a patient is logged into an app. The application makes request to the main database for all information of the current patient with respect to his user id, the data retrieved from databases stored on local database of the android application and is displayed whenever they are required to be shown for example the data such as sensor values is not directly shown in home page, the prescription also load by time of logon. Similar scenario with the doctor too. They will show and manage data as their needs. PHP server is chosen for data organization and storage. Android application and website will be flexible in all operating environments .proper error handling by GUI dialogue boxes other errors are occurred due to the damage of hard ware unit. Each function and modules of system and features are analyzed and explain in result analysis. Here software module is easily maintainable but the hardware case is difficult. Fig 3 refers the simple architecture and sample model block diagram of the system.

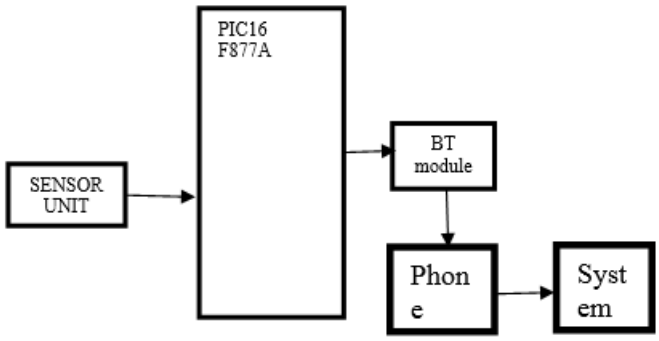

Figure 3 Simple Architecture of System

VII. ACTIVITY AND DATAFLOW DIAGRAM

A. Activity Diagram

Activity diagram is used to represent actions of each component of the system in different phases. The first activity diagram states that the micro-controller sensors read the health status and send phone via Bluetooth .this is the first main action of the system in the first phase. A second activity diagram is used. To represent proper medicine take will provide alarm indication and LCD display as well app notification is the second phase of action. The third action represents PHP and app communication controlled via Bluetooth and internet.

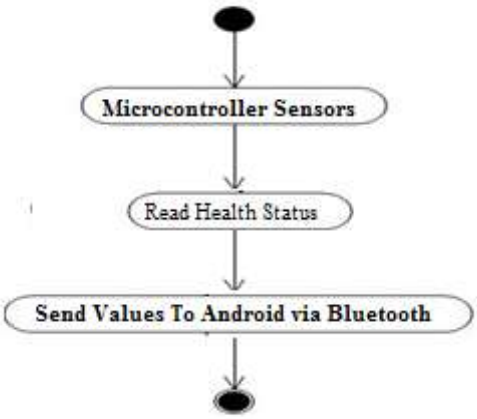

Fig4; Activity Diagram 1

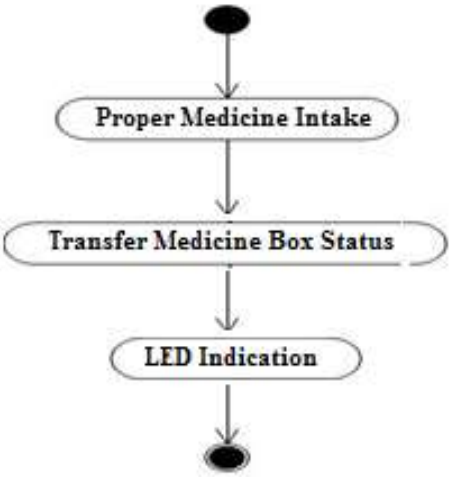

Fig5; Activity Diagram 2

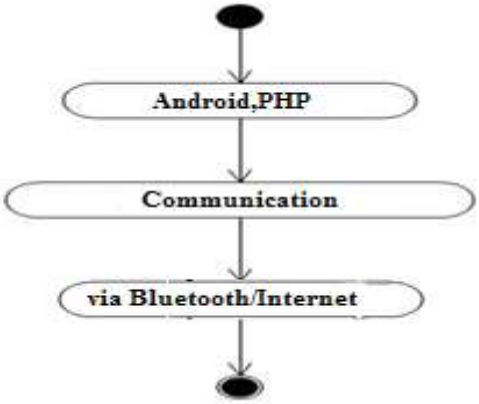

Fig 6: Activity Diagram 3

Fig 4, 5, 6 Explain the Actions Performed the System in Different Phase Expressed the Processes in Activity Diagram

B. Data Flow

Dataflow diagram describes the flow of data, the first level of DFD is context level which describes overall data flow of the system. Level 1 describes communicational connection and exchange of data and storage of data. Level 2 described software data communication and data retrieval process.

VIII. RESULT ANALYSIS

From the analysis of the system, it is more efficient to hospital management system in future as implement cloud based real world application. This small model leads to analyse to measure efficiency, accuracy, Time delay sensor processing, networking and connectivity and a major study of hospital functioning.Analyse quality of the sensor is the main draw back and it is more costly. If it is implemented in future as sensors as wearable devices and wearable computers controlled this will effective for users. And a cloud based IoT system implement in advancement is effective for real time implementation .the enhancement in such a way is going progress. Enhancement of controller will get an addition to taking parallel data accessing from hardwares.it will improve the patient and doctor as a keep in touch. Easy for using the proposed system will helpful for users. A huge amount of data is controlled by the database. Easier updating and control of data. Automation did properly it will lead to time consuming. Sensors are taken more accurate reading similar to the manual process, so accuracy is concerned with very high.

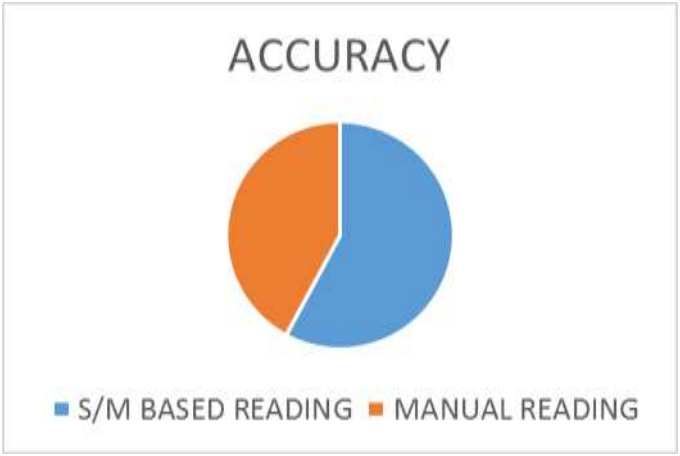

Fig 7 Accuracy Analysing

The system accuracy is measured by the features of the health condition tested in the manual and proposed system compared. And analyze that it is more applicable to future as well as enhance cloud based network for applying the management of hospital system automatically.

EXPERIMENT	MANUAL READING	S/M BASED READING	ACCURACY
ECG	75%	75%	BOTH
TEMPARATURE	75%	80%	SYSTEM
HEART BEAT	80%	90%	SYSTEM
CONSULTATION	100%	100%	BOTH
TIME BASED	50%	90%	SYSTEM
EFFICENCY	60%	75%	SYSTEM
PERFORMANCE AVG,	45%	55%	SYSTEM

Fig8: Feature Analysis Table

Measured android App, sensors, website accuracy and time consuming based analysis is shown below

Test case	No.of test case passed from total	No.of test case failed from total
Website	20	5
Android app	10	4
Sensors	50	10

Fig 9 System Test Analysis

The website, Android App, Sensors are tested and pass or fail testing analyzed in the figure.

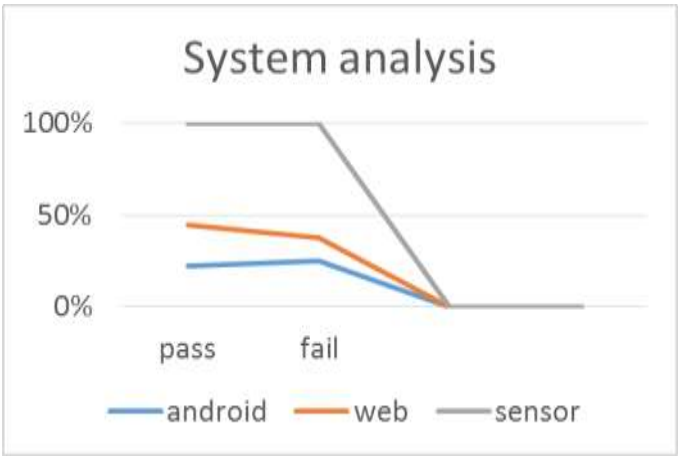

Fig 10 System Tested Graph

The fig 7, 8, 9, 10, explain the analysis of the system capacity, efficiency, accuracy, time consuming, system handling are analysed.

IX. CONCLUSION

The future enhancement of this system are Implementation of online chat, video conferencing Enhancement of sensors, Voice Control commands, Wearable Device connection, enhance Wi-Fi connectivity in the place of Bluetooth enhance the distance coverage. Increase the security. Cloud- based server execution and implanted this work in all hospital management system.

Proposed Health care applications have a huge amount of data can be stored in the database. Easier updating and control of Data. Communication between doctor and patient they are kept in touch. These objects can be enhanced to interact with human beings by utilizing the internet and mobile or other network facilities and Analyse Enhancement of system in the real world using the cloud based system for the proper working of hospital management system. The proposed system is more accurate, time consuming, efficient, sensor delay network connectivity is more flexible. Simplified model enhancing in cloud based system as real world implementation work is on progress, and future enhances sensor connectivity, and wearable device application enhances the parallel executing by change controller with advanced features Bluetooth connectivity enhanced to increase the distance of connectivity by applying WI-FI. Based on the references I can generalize to induce a new system for the hospital management system as doing progress.

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