

# Health Monitoring Wheel Chair cum Bed System

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**ABSTRACT:**In our busy day to day schedules, we often overlook minor symptoms of some acute diseases, which lead to some other chronic diseases. So it's better to take precautions before it gets us. Many projects in the sector of Health and wheelchair were made, which mainly focus on Health Monitoring System or Wheel Chair to Bed Converter, which gives an ease to patients. In our project, we have designed a convenient, smart and cost effective Wheelchair cum Bed Health Monitoring System, where it can transform from chair to bed and vice versa using the concept of a Lever, Recliner, and a Battery-Operated Linear Actuator. Simultaneously it also monitors basic and important Health parameters like Heartbeats, Body Temperature, and Body Weight, using sensors. All these parameters will be updated to concerned persons via SMS using GSM Module when the range specified of the normal condition is overrun. This prototype mainly focuses on cost effective availability, which can be accessed by any needy person. This system can be used for both commercial/ medical use and for personal usage, by any age group.

**KEYWORDS:**Lever, Recliner, Linear Actuator, GSM Module, and Wheelchair cum Bed.

## I. INTRODUCTION

Medical cases are emerging at a faster rate, and are using technology to handle/ monitor everything, and from anywhere, as time changes the more advanced methods come. In this paper, we have solved two basic problems together associated with the traditional approach, along with easy availability. Firstly, the doctors must be present beside patient to make treatment [1]. Secondly, dependence of patient on the care taker to get onto bed and again to get in chair. Basic principle of the project is to overcome these issues by, informing basic health parameters of patient or person sitting on chair to concerned person/ doctor via an SMS when abnormalities like heart rate goes beyond 100bpm else below 60bpm. Or when body temperature goes beyond 37°C OR 97°F. or when sudden change of body weight is noted by their respective sensors, which are placed on wheelchair. And also to help the care taker to avoid heavy lifting situations that may put their back at risk of injury, and allow the care taker to restraint more energy at the end of the workday [3].

As the time changed the requirements of wheel chair and health monitoring parameters also changed, according to different classes and requirement of the patients. Lots of research and development is being done on this field to meet their requirements [4], mostly in present scenario patients have to go hospital and do their routine check-up, which becomes difficult for old people to travel [1]. Instead they have an option to sit back at home and update, to doctor and get diagnosed through phone only if the condition is not serious. And all wheel chairs overcome the issue of mobility to patient but indeed give them dependence on care taker to get on to bed and vice versa. Which may leave patient in a guilt of dependence on care taker. so to avoid that negative feel or thought, we have interfaced health monitoring system with chair to bed convertible wheel chair. Where Recliner and Piston are used to adjust the back rest of the chair, and Battery operated piston is used to adjust leg rest of the chair. Hence the overall proposed system will be able to perform both Health Monitoring System as well as Chair to Bed Converter.

## II. RELATED WORK

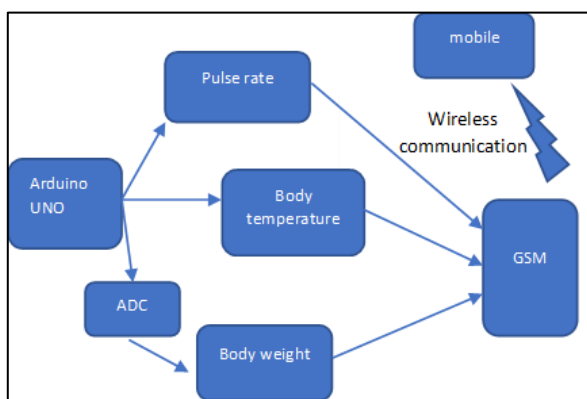
Prior to start with the work, we came to know that, till now health monitoring wheel chairs are made with interfacing of sensors like the body temperature, body weight, heart pulse rate, ECG and many more, which monitor the described

health parameters of the patient via their respective sensors. And then those details are sent to concerned person/doctor via wireless communication method like using Internet Of Things (IOT) or GSM Module. Then the person takes action accordingly, here these projects are confined till health monitoring systems and some are also interfaced with self operated wheel chair. And on the other side only chair to bed (vice-versa) converter are made. Where the resting chair is converted to bedding bed, Which gives an ease to patient and the care taker who looks after the patient. In our project we have designed a health monitoring wheel chair cum bed, where the health monitoring part and the resting part both are interfaced together, Which gives an ease and independence to the patient. And the prototyped system is asic model and cost effective which can be afforded by middle-income group people.

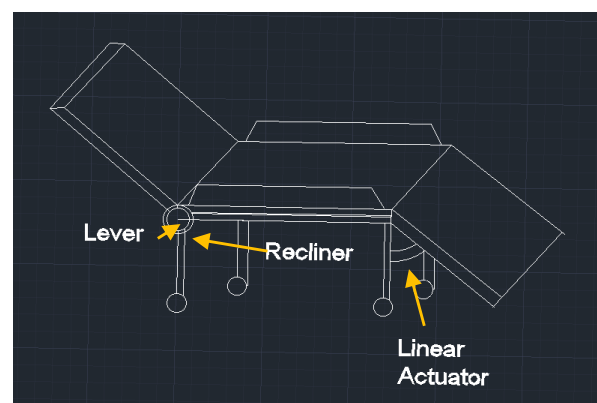
### III. METHODOLOGY

In our Health Monitoring System we have integrated Heart Rate sensor, Body Temperature sensor (DS18D0) and Load cells (weight sensor) along with HX711 (Analog to Digital converter). Heart rate sensor is placed at hand rest part to give ease for putting fingertip on the sensor to check Heart Pulse, Temperature sensor is kept at the back rest of chair which gives an ease to put temperature probe under armpit to check Body Temperature, and finally Load cells are placed at the base of wheelchair, along with HX711 to measure Body Weight. All these sensors are interfaced with Arduino microprocessor, where the respective Analog and Digital output of sensors are collected and checks for any abnormalities using prewritten code. If any abnormalities are noted then GSM Module connected to Arduino will send an SMS alert to concerned doctor. And so required action can be taken. A combined set of Lever and Recliner are placed at the joint of back rest and seat of wheelchair which gives an inclination to the seat. And a battery operated Linear Actuator will be placed at the joint of leg rest and seat of wheelchair which helps to set inclination to leg rest part. A small 12V battery will be used to power supply Arduino and battery operated piston. Cost of above mentioned components and setup is less, as compared to other existing systems and will be available for needy people.

### IV. SYSTEM ARCHITECTURE



(a)



(b)

.Figure:(a) overview of Health Monitoring System (b) overview of Chair cum Bed Mechanism

### V. HARDWARE USED

#### A. Arduino Board UNO

The Arduino Uno is an open source microcontroller board based on Microchip ATmega328P microcontroller. We preferred Arduino platform because its specifications meets perfectly with our requirements, as it has flash memory of 32 KB, 2 KB of ram, clock speed of 16MHz, 14 digital I/O Pins, 6 Analog input pins, operating voltage of 5Volts. It is also responsible for establishing connection between wireless communication system with sensors. Along with conversion of Analog data to Digital data.

#### B. GSM SIM900A

Indian Telecommunication Standards for communication are 900MHz so we used SIM900A. This module is one of the common and cheapest module for air interfacing of Arduino with remote mobile phones where internet connection is difficult. It is mainly used to send health parameters to doctor when patients health gets abnormal. It operates on low

power supply of minimum 3.3V, and for programming it uses simple AT Commands to configure, it has configurable low power sleep modes and a small form factor [2].

C. Heart Rate Sensor

It is one of the reliable and cheapest available sensor in market for detection of heart pulse. It has in-built noise eliminatory circuit in it, which eliminates the surrounding noise for measuring the heart rate, and it is easy to interface with Arduino too. We just have to place our index figure on it, to get accurate readings. The output from sensor is digital which gives direct heart pulse reading. and so we preferred Heart rate sensor.

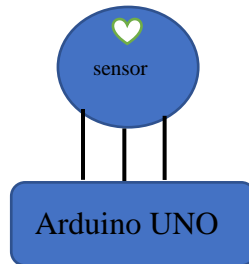
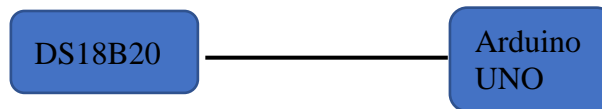


Figure (c):-Interfacing of Heart rate sensor with Arduino

D. Temperature Sensor (DS18B20)

Body Temperature is an important factor for health monitoring system. We have used water proof DS18B20 Sensor, for measuring Body Temperature. Our Temperature sensor is placed at the back of chair, where the probe will be adjustable and placed in armpits. It gives result in Degree Celsius which eliminates the work of converting output data to Temperature. And it has flexible interfacing with Arduino with parameters as accuracy of +0.5°C, Temperature range of -55°C to +125°C, current usage of 1mA.



Figure(d):- Interfacing of Temperature sensor with Arduino

E. Weight Sensor:

Body weight is one of the most important parameter to be considered while quick health check [2]. one of the cheapest and accurate possibility of getting body weight is by using a Load cell. A 40Kg of Precession Grade C2 Load cell is used. We will be interfacing 3 Load cell of total weight 120Kg. Output of the Load cell will be in electric signals, so we will interface Load cells with HX711 module (ADC) which operates at 5V and communication with Arduino Is done using serial SDA and SCK pins.

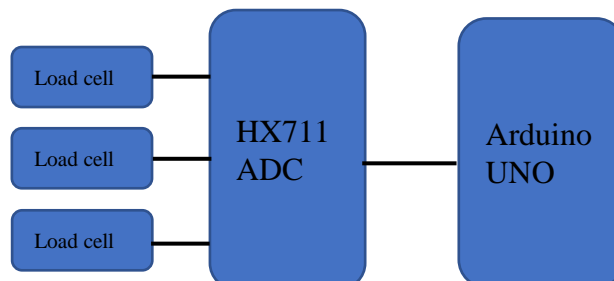


Figure (e) :- Interfacing of load cells with Arduino

F. Recliner

Recliner is the main central unit of Chair cum Bed mechanism. It is interfaced with Lever and Battery operated Linear Actuator. Recliner will be used for the main inclination of seat and leg rest. Recliner has ball bearings in it's seat by



which the seat moves back and front upon the pressure given by lever. Back part of Recliner seat and lever are assembled together, when lever is pressed the recliner makes the decision that how much amount the seat has to be adjusted. Similarly front part of Recliner seat will be attached to a Battery operated Linear Actuator which will give smooth inclination of the leg rest and provision of locking at a particular point.

#### G. Lever

A lever is a rigid bar which is connected to a pivot, and is used to move a heavy or fixed load when force is applied on other end. The back rest of the wheel chair will be adjusted with the help of a lever and Recliner which is assembled down on right side of the seat. The lever has various joints / lugs in it for locking purpose, as the patient presses the lever, seat can be adjusted accordingly as per requirement of patient. when the patient releases the lever the seat will be locked.

#### H. Linear Actuator

Linear Actuator is a device which causes motion in straight line, in contrast to circular motion of conventional electric motor. It is operated from Battery which is used for the legs rest system. With the help of Linear Actuator the leg rest will open and close accordingly. Linear Actuator is attached with a button, when this button is pressed the actuator gets connected to battery and the leg rest will open. It's speed of opening and closing will be dependent on the voltage given to actuator. It's maximum voltage can be 12V and minimum of 6V. So hence in our project we have used 6V power supply, which will give smooth adjustment and doesn't give any jerk to the patient ensuring better efficiency and comfort to patient.

### VI. CONCLUSION

In our proposed project, Health Monitoring system is interfaced with chair cum bed mechanism. Which gives an ease to patient and doctor. when health abnormalities of patient is observed, like when heart rate goes beyond 100bpm and below 60bpm. Or when body temperature goes beyond 37°C OR 97°F. then the GSM Module will send SMS to concerned doctor. Which gives an ease to old patients to get assisted when minor issues are seen. And simultaneously it also gives an ease to the care taker who is looking after the patient from the back pain.

### VII. FUTURE SCOPE

This project can also be interfaced with more sensors according to requirement of patient. project can be interfaced with IOT to keep records of patient health parameters, and also maintain medical history, and can be used to order medicines online upon completion of medicines. And can also configure the chair to height adjustable by using a hydraulic jack along with recliner.

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