



Smart Waist Belt using Internet of Things

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Abstract: Back pain is one of the most common and widespread problems in today's obsessive-compulsive lifestyle. Reasons for having back pain problems can be muscle spasms, heavy lifting, cracked discs, sciatica, abnormal spinal curvature, poor sleep habits etc. sleeping or sitting incorrectly is the common cause of pain in the lower muscle. The ultimate solution for this is to change routine habits. For more help use our "Smart Waist Belt+ Mobile Application" which is a clever IoT and Android tool by which the user will not get into wrong position. Adding a module that measures pulse rate and oxygen level makes it more useable in daily life. App clearly warns the user whenever they enter the wrong position or the pulse rate or oxygen level increases or decreases. The android mobile app shows the dimensions, temperature, heart rate and oxygen level which doctors and users both can track and perform according to their needs.

Keywords: Internet of Things, Wearable Device, Activity Recognition, Health Behaviour Change, Smart Health Care, Digital Health Care, Posture Alert, Accelerometer, Heartbeat, Oxygen level.

I. INTRODUCTION

At some point in their lives, most adults have low back pain. It is the most common cause of work-related disability and lead contributor in absentee working days. In an extensive study, more than a quarter of adults reported experiencing low back pain in the past three months. Low-grade pain, which can range from severity, chronic pain to a sudden, sharp sensation that leaves a person paralyzed equally affected men and women. Pain may begin suddenly because of an accident or lift of a heavy object, or it may develop over time because of age-related changes in the spine. Lifestyle can also set the stage for low-level pain, especially when the midweek exercise program is very low with weekend exercise. Most back pain is severe, or short-lived, and lasts for a few days to a few weeks. It fixes itself by taking care. Low back pain is routine, so there are dysfunctions in the way they define parts of the meet and move Acute and chronic low back pain is pain that lasts between 4 or more weeks. The cause of the lower back pain is after the initial injury. Some people affected by lower pain mature chronic pain within a week. The treatment effectively relieves chronic back pain, but in other cases, the pain continues notwithstanding treatment. The severity of the burden from low back pain has increased significantly in recent years. In 1990, a study identified the hardest conditions in the U.S. with death or poor health because of diseases that have placed low pain in the sixth place; in 2010, low back pain increased to third place, with only heart disease and COPD (chronic obstructive pulmonary disease). Your heartbeat is usually regulated by a sinus node in the right atrium of the heart. The sinus node causes electrical impulses that normally trigger each heartbeat. These impulses make the atria muscles contract and pump blood into the ventricles. The electrical impulses then come at a cluster of cells called the atrioventricular node. The atrioventricular node decreases down the electrical signal were sending it to the ventricles. This small lag allows the ventricles to load with blood. When electric impulses reach the tissues of the ventricles, they incur, making them pump blood either to the lungs or to the rest of the body. In a salubrious heart, this process normally goes smoothly, following in a healthy resting heart rate of 60 to 100 beats a minute

II. LITERATURE SURVEY

The human body system includes three-dimensional data based on composition and anthropometry, 3D seat data and flexible assembly interactions between the body and the seat based on the kinematics of the human body [1]. Inactivity is a widespread situation in modern society. A particular posture may cause health problems [5]. Many wearable devices and Internet of Things (IoT) health care equipment (s) have been developed and released on the market to prevent injuries in recent years. However, their price is not high for individuals. The chair recognition system can categorize seven different health-related seats. This technology focuses on health management based on empathy and perception of the current state of users. The waist position is the most suitable place for independent work recognition because the acceleration patterns are very similar to the same function for different users. The WaistonBelt X provides sensory and interactive functions with a device with a wearable belt type. It can automatically measure the waistline with a

magnetometer that detects the movement of metal placed in a bucket [4]. The most crucial factor in the human body is pulse rate and oxygen level both are added in the belt, measured by a specific sensor using red and infrared light

III. PROPOSED SYSTEM

The propounding system has NodeMCU, MPU6050, MAX30100, Buzzer. The MPU6050 gyroscope sensor with NodeMCU is used to detect various angles. NodeMCU is a controller that takes care of receiving data from the hearing process, transfers it to the database, and provides notification via a buzzer. In total, six different angles are offered by the Mpu6050, which is a digital motion processor. Also, we use a real-time database to store all user data, which we later used for displaying in our application. The MAX30100 gives Pulse rate and Oxygen level. It has two light-emitting LEDs. One is a red light, and the second one is infrared light from which pulse rate is measured by infrared light. The infrared light and red light both are used to measure oxygen levels in the blood. Our app provides an excellent interface to see various data about positions, pulse rate, the oxygen level in an understandable format.

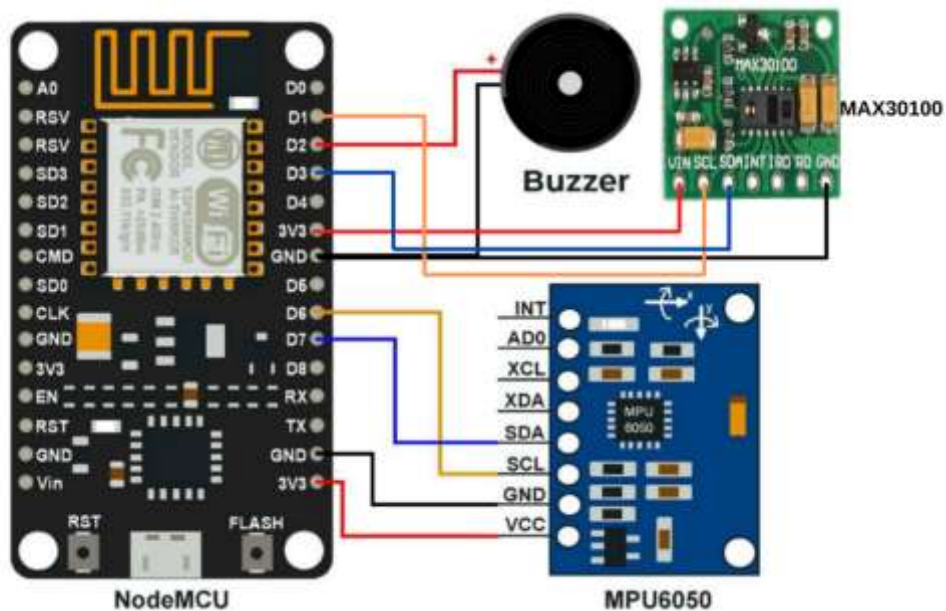


Figure (1) Proposed system

3.1 System overview

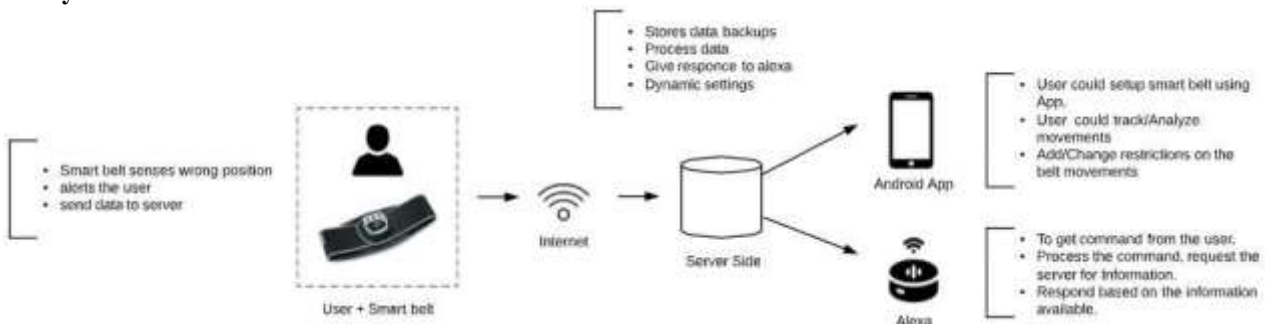


Figure (2) System overview

3.2 Firebase real-time database

The firebase gives two types of database one is a real-time database and another one is fire-store database with the help of cloud and NoSQL. All the data is stored as JSON. Data from the IoT is shared to the real-time database in the form of value by authenticating Arduino IDE and Firebase using HOST and AUTH. By using API, firebase provides data to flutter applications with the instance and automatic updates with the newest data. Real-time data provides it secure for our users to obtain their data from any device with the given email and password.

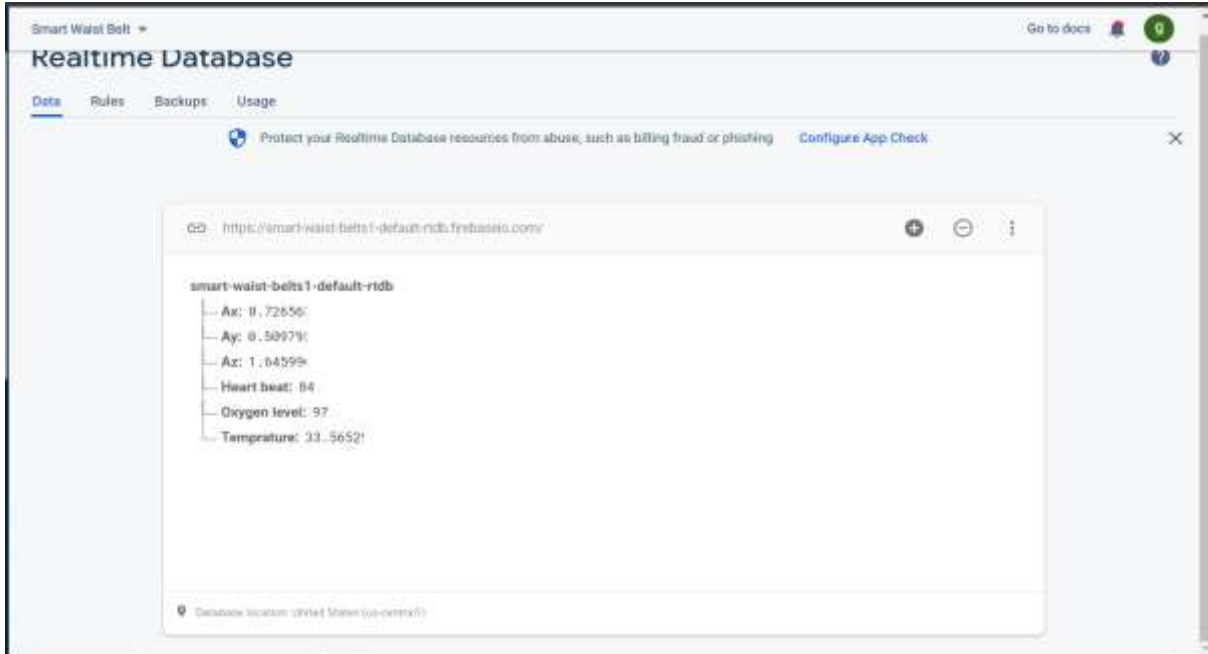


Figure (3) Firebase real-time database

3.3 Flutter application

The flutter is used to develop a mobile application with cross-platform support. Google has developed and managed it, and it's free and open-source. We have used the dart programming language for the development of an app that is perfectly running in android. The application is a 2d mobile app with user authentication. Flutter has a high-performance rendering engine to draw widgets, so developers have excellent control over the system. The app has 3 charts of X, Y and z-axis which will show the posture of the user and when there will an uncertain position app will give an alert. Looking towards the recent scenario because the coronavirus pulse rate and an oxygen level are very crucial, so we have added them to our smart belt and the live reading will be shown in the app which also alerts if the reading goes above the given perimeter.



Figure (4) Login UI



Figure (5) Main UI

On the very first page of the app, there is three alignment perpendicular to each other i.e x-axis, y-axis and z-axis. For which we use MPU6050 which is the world's first Motion Tracking module designed for a cheap cost, economic power, and high-performance and also it is a wearable sensor. There is a predefined position set as a default so that position is most suitable to the user and the doctor will give an extreme position where a user should no move and if they get in such position there will be an alert on the screen which will remain till the user goes onto the default position. Adding to it,

there is a MAX30100 module use for pulse oximetry and heartrate monitor sensor. It links two LEDs, a photodetector, optimized optics, and low-noise analogy signal processing to recognize pulse oximetry and heart-rate signals. It has Ultra-Low-Power performance boosts battery life for the wearable smart belt. It has two light-emitting LEDs. One is a red light, and the second one is infrared light from which pulse rate is measured by infrared light. The red light and infrared light both are used to measure oxygen levels in the blood. A normal person's pulse should be between 60 to 100 beats per minute which depends on the position of the person. whereas a normal level of oxygen is usually 95% or higher. but it also varies depending on age and position and health issues. If it is lower than 95% there will be an alert on-screen and immediately contact the doctor.

All the data is real-time and is processed through modules and given to the real-time database to the firebase which is redirected to the Application



Figure (6) X,Y,Z-Axis



Figure (7) Wrong Posture alert



Figure (8) Low Pulse Rate



Figure (9) Low oxygen level

IV.PROCESS

4.1 Doctor's flow

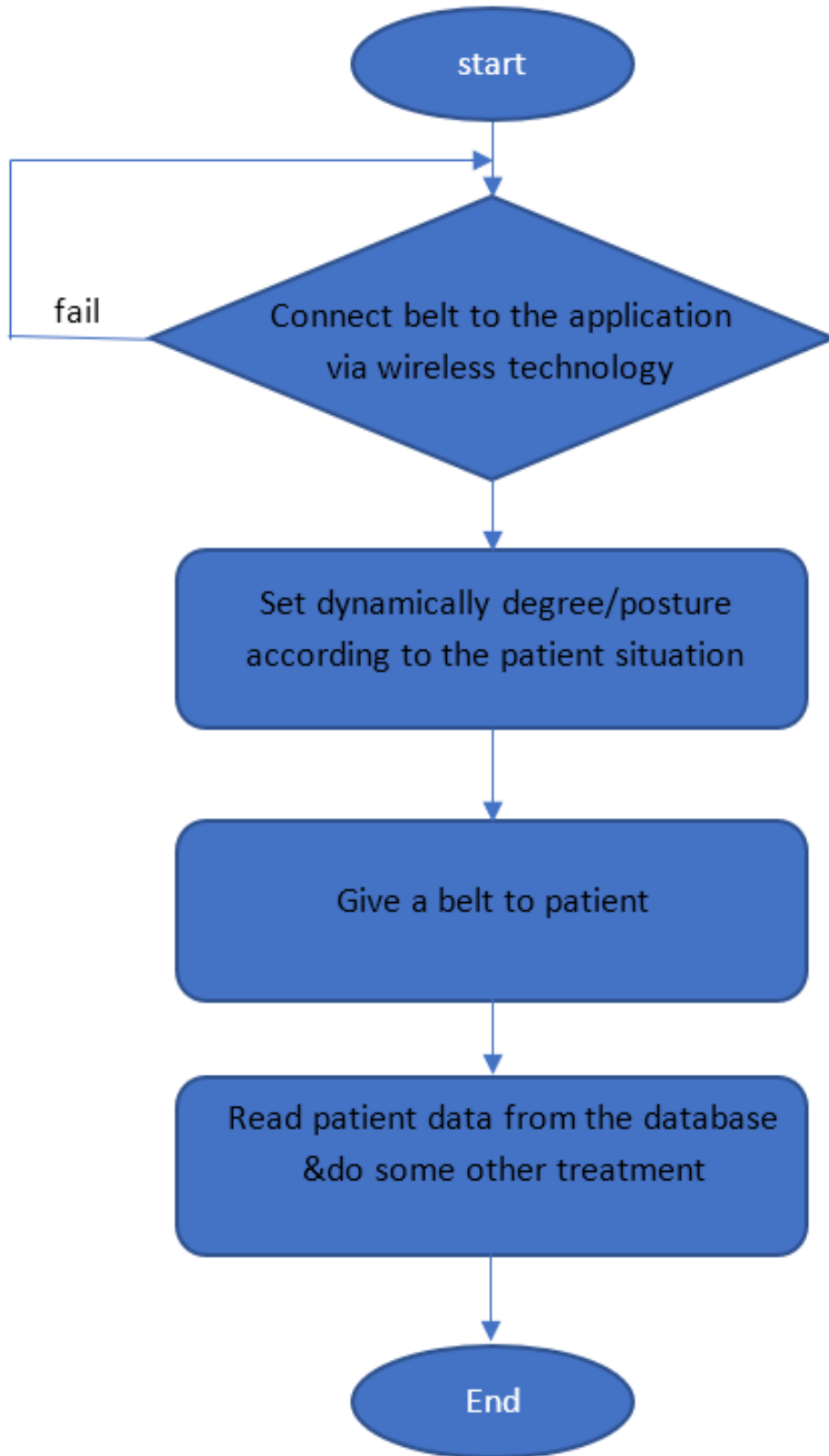


Figure (10) Doctors Flow

4.2 Patient's Flow

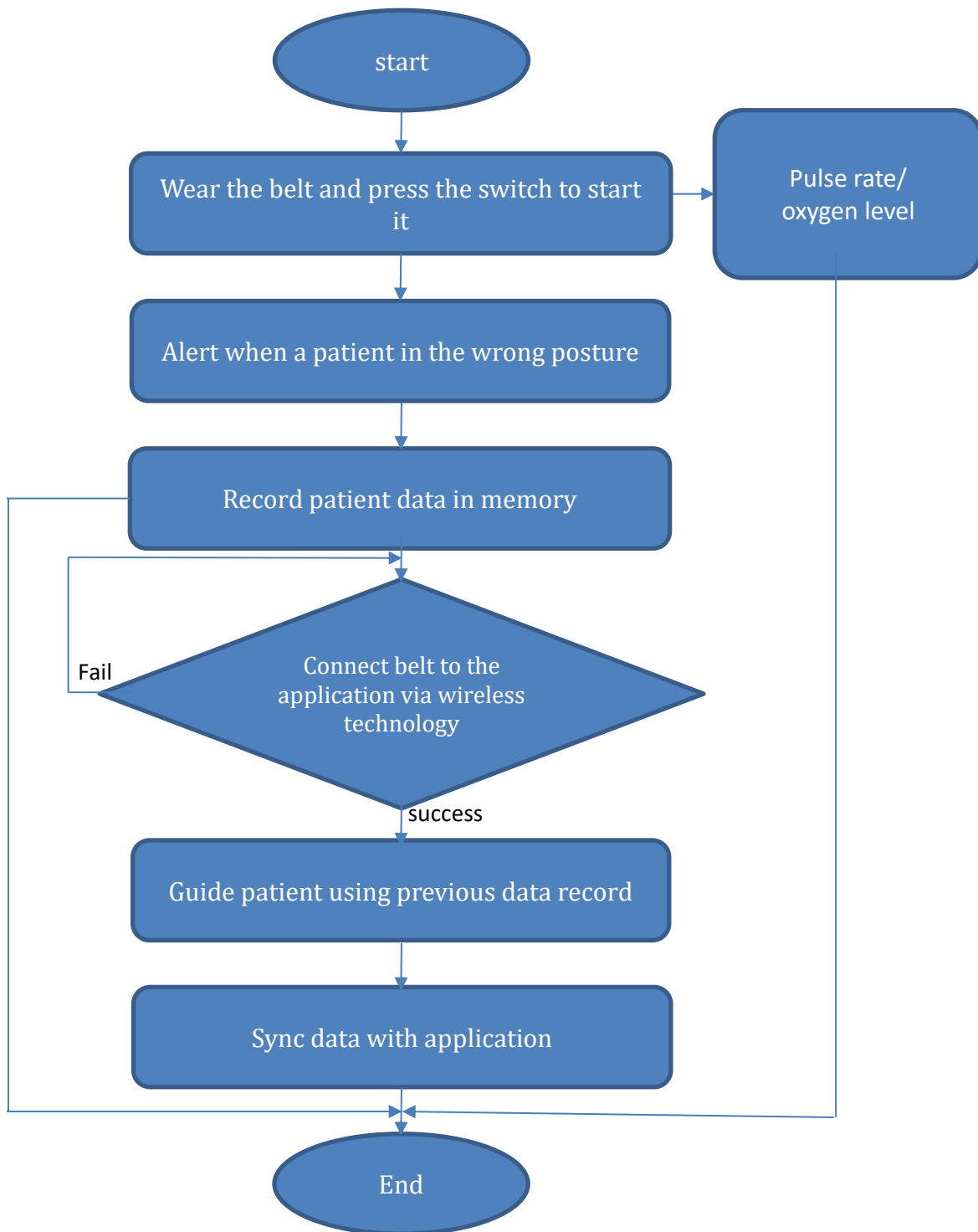


Figure (11) Doctors Flow

V. CONCLUSION

In this regard, we have proposed a health support system that provides a solution to improve, maintain, or restore health or prevent disease through innovative tape. Our work has achieved shallow power consumption, hardware simplicity and high accuracy among related functions. So, this is a solution that changes your bad habits very quickly.



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