Sign To Speech :A Smart Hand Gestures based Communication System Using Arduino

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Abstract- *An abstract Human hand gestures capturing and recognition provide an intelligent and convenient way for use in application from human-machine interface (HMI) and human-computer interaction (HCI) to deaf and dumb people. The wearable gloves are worn by human hand to ensure that the sensors are accurately attached to the human joints for accurate measurement of joints movements of human hands and fingers. The experimental results of hand from static gestures capturing and recognition verify the effectiveness of the proposed methods and results upload in cloud to interaction for the normal people.*

Keywords- Analysis Patient-nurse communication, accelerometer, wireless sensor network, disability, accessibility, healthcare.

I. INTRODUCTION

The main purpose is to replace the conventional approach of patient-nurse communication with modern technologies that provide a much faster and reliable way to do so. In the current scenario, the patient has to be dependent on a family member or mostly a nurse both of which have to attend to the patient constantly. Objective of this method is to make such patients independent to communicate with the nurse by the simple task of tilting a device located on his finger or any other part of the body that is capable of movement. After the patient sends the message the nurse can remotely monitor their requests and provide assistance without any further delay. Nowadays, a lot of active research is taking place in the wireless field and very less in its public implementations. Lot of techniques has been devised for sensing the hand gestures & doing the appropriate actions. A technique based on glove is a popular mode of recognizing hand gestures

II. EASE OF USE

2.1 For Patients :

Attach the accelerometer: The accelerometer, a small sensor, will be attached to a movable part of the patient's body, like their finger or wrist.

Tilt for communication: When the patient needs assistance, they simply tilt the accelerometer in different directions based on pre-assigned meanings. For example, tilting forward might signal needing a nurse, tilting backward might request medication, and tilting left or right could indicate specific needs like water or pain relief.

Simple interface: The system avoids complex controls or buttons, relying solely on intuitive tilting gestures for patients to communicate. This makes it accessible even for those with limited mobility or dexterity.

2.2 For Nurses :

Centralized receiver: The nurse station will have a central receiver unit that receives messages sent from all patients using the transmitters.

Visual and audio alerts: The receiver displays the message received on an LCD screen, clearly indicating the patient's need and the direction they tilted for. Additionally, an audible buzzer might sound for urgent messages like emergency alerts. Quick response: The nurse can then quickly respond to the patient's request based on the displayed message. This streamlined communication system allows nurses to attend to patients' needs more efficiently.

2.3 Additional features for user-friendliness:

Real-time medicine reminder: The system can integrate with medication schedules, sending automated alerts to the nurse when it's time for a patient's medication, ensuring timely administration.

Emergency button: Patients can press a dedicated button on the transmitter for immediate assistance in case of an emergency.

Voice recording and playback: The system can record and play back pre-recorded messages for patients who have difficulty speaking, further aiding communication.

III. MODELING AND ANALYSIS

3.1 Input: specific tilting movements detected by the four-axis accelerometer, translating into predefined messages.

3.2 Output: The project outputs messages on the nurses' station LCD screen and optional vocalized alerts in response to specific patient inputs like medication reminders or emergencies.

3.3 Functions:

I. **Data Acquisition:** Extracts and interprets sensor data, identifying any significant deviations from the established reference.
II. **Alert Activation:** Triggers the buzzer and LCD display based on detected irregularities.
III. **Information Broadcast:** Presents visual details regarding the patient on the LCD screen& vocals.

3.4 Success Conditions: Project success hinges on effective communication, user empowerment, timely responses, reliability, reduced nurse workload, medication adherence promotion, cost-effectiveness, user satisfaction, integration with existing systems, and potential for future development.

3.5 Failure Conditions: Failure conditions for this project may arise from

1. Inadequate responsiveness
2. Inaccurate message transmission
3. Potential system malfunction due to RF communication interference

IV. PROPOSED SYSTEM

In the existing healthcare system, a comprehensive approach is employed for continuous monitoring of patients' physiological conditions through the integration of a Wireless Sensor Network (WSN) facilitated by Zigbee technology. This innovative system utilizes a network of sensors strategically placed to capture and transmit real-time data on various physiological parameters. These sensors meticulously monitor vital signs, such as heart rate, blood pressure, temperature, and other critical indicators that offer valuable insights into a patient's health status. The data collected by these sensors are wirelessly transmitted using Zigbee, a reliable and energy-efficient communication protocol. Zigbee serves as the conduit for seamless and rapid transmission of the physiological information from the patient's location to a remote wireless monitoring station. This station, typically accessed by healthcare professionals, allows for immediate acquisition and analysis of the observed patient's physiological signals.In addition to the monitoring aspect, the system incorporates medical devices such as infusion pumps, enteral pumps, patient-controlled analgesia (PCA) pumps, and insulin pumps. These devices play a pivotal role in healthcare facilities worldwide, both in hospitals and home settings. Enteral pumps are specifically designed for the precise delivery of medications and liquid nutrients to a patient's digestive tract. PCA pumps are utilized to administer pain medication in a controlled manner, empowering patients to manage their pain effectively. Insulin pumps, on the other hand, are indispensable for individuals with diabetes, delivering insulin in a regulated manner. The significance of these devices is underscored by their ability to provide nurses with real-time status updates on the administration of medication and nutrients, ensuring accuracy and patient safety. In hospital settings, these devices have become indispensable tools for healthcare professionals to closely monitor and regulate the intake of medicine, thereby enhancing the overall quality of patient care. This integrated system not only revolutionizes patient monitoring but also facilitates a more streamlined and efficient healthcare process, ultimately contributing to improved patient outcome.

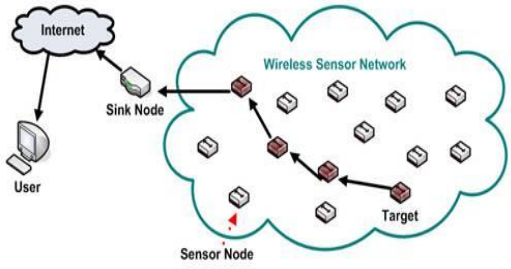

Figure 1 : WSN network Diagram

V. RESULTS AND DISCUSSION

All the main points of the research work are written in this section. Ensure that abstract and conclusion should not same. Graph and tables should not use in conclusion.

In the result, our communication system offers a practical and user-friendly solution to address communication challenges for disabled patients in healthcare. The integration of a Transmitter Unit worn by patients and a Receiver Unit at nurses' stations enables independent and timely communication through intuitive movements. With features like the1. Medicine Reminder 2. Emergency Buzzer 3. Alarm System the system not only improves healthcare outcomes but also streamlines nurse response and proves cost-effective. Its affordability and simplicity make it adaptable for both hospital and home care settings. Future research could explore additional integrations, customization, and advanced

technologies. Overall, our project strives to create a more inclusive healthcare environment, empowering patients and enhancing communication for better overall care.

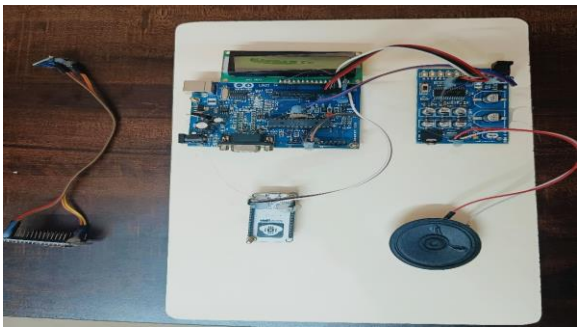

Figure 2 : Simple Hardware with Transmitter and Receicver

VI. CONCLUSION

In this system where we can send the signal given by patients wirelessly through the gesture movement by body parts to the nurse, the information hence will be displayed on the LCD display. Each patient will have such a device installed on or around his body and all such patients will be centrally linked to the receiver at the nurse side. This project will definitely help the people who are not able to do the full movement of the body. This project is aiming to fulfill the communication gap between these people and the normal ones. The accelerometer we are using is of 4 axes, so it is very accurate for very small movement also. If a person with disability is hungry, he will do some movement with the body part containing accelerometer. Buzzer will become on and a message will be displayed on the LCD. Along with this a real time medicine reminder and an emergency buzzer to simplify the work of the nurse was implemented. Our system provides a reliable, effective and simple yet important solution to various issues faced by nurses in traditionally communicating with disabled patients.

REFERENCES

[1] T. Mohana Priya, Dr. M. Punithavalli & Dr. R. Rajesh Kanna, Machine Learning Algorithm for Development of Enhanced Support Vector Machine Technique to Predict Stress, Global Journal of Computer Science and Technology: C Software & Data Engineering, Volume 20, Issue 2, No. 2020, pp 12-20

[2] Ganesh Kumar and P.Vasanth Sena, "Novel Artificial Neural Networks and Logistic Approach for Detecting Credit Card Deceit," International Journal of Computer Science and Network Security, Vol. 15, issue 9, Sep. 2015, pp. 222-234

[3] Gyusoo Kim and Seulgi Lee, "2014 Payment Research", Bank of Korea, Vol. 2015, No. 1, Jan. 2015.

[4] Chengwei Liu, Yixiang Chan, Syed Hasnain Alam Kazmi, Hao Fu, "Financial Fraud Detection Model: Based on Random Forest," International Journal of Economics and Finance, Vol. 7, Issue. 7, pp. 178-188, 2015.

[5] Hitesh D. Bambhava, Prof. Jayeshkumar Pitroda, Prof. Jaydev J. Bhavsar (2013), "A Comparative Study on Bamboo Scaffolding And Metal Scaffolding in Construction Industry Using Statistical Methods", International Journal of Engineering Trends and Technology (IJETT) – Volume 4, Issue 6, June 2013, Pg.2330-2337.

[6] P. Ganesh Prabhu, D. Ambika, "Study on Behaviour of Workers in Construction Industry to Improve Production Efficiency", International Journal of Civil, Structural, Environmental and Infrastructure Engineering Research and Development (IJCSEIERD), Vol. 3, Issue 1, Mar 2013, 59-66

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