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Sensor Based Human Activity Recognition

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Abstract : This paper is a reflection of the research that has been done to enhance and simplify the daily lives of elderly or disabled people. The goal is to use a variety of technological tools, including voice systems, deep neural networks, accelerometers, and the Internet of Things (IoT). It has created a method that makes life easier by allowing computers to recognize human wants. Here, the latest developments in neural networks and the Internet of Things were integrated to provide a more complex form that can adapt to the user and comprehend their behavior. Sensitive information is gathered by continuously monitoring the patient's condition. It was straightforward to tell the system to discern between the required output commands and carry them out thanks to Mems sensors. The appropriate output is shown on the LCD display panel.

IndexTerms - Memssensor, MicroPython, Raspberry pi Pico..

I.INTRODUCTION

Human Activity Recognition (HAR) is a very active area of research in pervasive computing and is already widely used. Applications for it include human-computer interaction, healthcare, intelligent environments, security, and surveillance. "Human activity recognition" is the process of tracking the whereabouts of one or more autonomous humans utilising a variety of personality, behavioural, and environmental parameters (HAR). The research employs camera-based and wearable-based methodologies to analyse two crucial HAR analysis tools. They are often more expensive because these applications require the installation of cameras and other support. Comparatively speaking, wearable technologies are more efficient and less expensive since they use wearable sensors like wristbands and smart eyewear to collect data on human behaviour.Wearable technology has recently become more practical to use in daily life because to its accessibility, simplicity of use, compact size, low battery consumption, and capacity for many tasks. The only method for detecting human activity (HAR) is computer vision analysis. Recent academic and business research has given increased emphasis to automation systems. Applications for security, visual surveillance, video capture, entertainment, and daily leisure activities are all becoming more and more necessary to grasp what is happening and rapidly identify unethical or potentially dangerous behaviour. HAR changes people's perceptions of all human-computer interaction, similar to what it does in the commercial world (HCI).

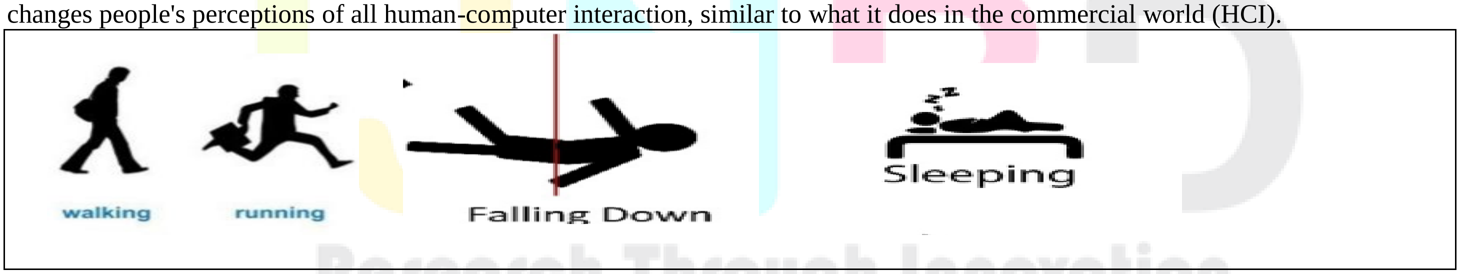

Figure 1 Human activity

Many academics have made an effort to use the HAR approach in their writing, particularly when talking with unconventional home, domestic-related, sporting, and public behaviours. HAR is also necessary for the healthcare system to monitor and assist patients' rehabilitation activities, including their actions and behaviours. Both the human eye and other resolution or sensor technologies have been used to locate a piece of the HAR mechanism.

II.LITERATURESURVEY

VenkataRamana, Lakshmi Prasanna, [1] Human conduct recognition, which has a wide range of applications, including character police work, is a representative working area within the field of computer vision. CNN is used to train the model.LamiyahKhattar, GarimaAggarwal, [2] The 2-D Convolution Neural Network and the Long-Short Basic Quantity Memory are the two models that are frequently presented. To preserve the consistency and accuracy of the survey, each model is trained on the same dataset, which comprises of information obtained from a public website and gathered in bulk using wearable sensors. They each employ a unique accuracy and confusion matrix.Long Cheng,Yani Guan, [3]Using information from wearable sensors, this research formulates the topic of body exercise focus as a classification problem. The support vector machine, the hidden Markoff mannequin, and the artificial neural network are three further computers that are developing their grasp of the methods used to recognise odd physical behaviours.Ran He, Zhenan Sun [4], It is called near infrared-visible (NIR-VIS) heterogeneous face consciousness when NIR and VIS facial images are matched. Current heterogeneous strategies aim to extend VIS face attention approaches to the NIR spectrum by merging VIS and NIR pictures.According to test findings, our network not only creates VIS face images with high resolution, but also helps to accurately identify diverse faces.Jing Wang, Yu cheng,[5]In this paper ,it examine the faces of casual walkers on more than forty hours of sparse footage, we frequently have the ability to conceal tens of thousands of unusual identities and mechanically extract nearly all of them. The similarity of images linked by the same track and optimization for location and weather forecast allow for the capture of extra face attribute possibilities, which are important for identification. Finally, the community is modified using samples that have been carefully annotated.Yongjinglin,Huoshengxie, [6]This paper proposes an algorithmic face gender classification rule. The input photographs are first subjected to face detection and preprocessing, and the faces are also transformed into a standard format. Second, characteristic vectors that represent the face in the workspace are extracted using the face awareness model. The effectiveness method for identifying facial gender is demonstrated by the algorithms on the Asian celebrity face dataset .MohanadBabiker, MuhamedZaharadeen, [7] in this paper,at each stage, the system makes use of a variety of digital image processing techniques, including heritage subtraction, binarization, and morphological operation. Initially, only data retrieved from the body was used to build a neural network.The activity model of the dataset was categorised using a multi-layer feed-forward perceptron network. A total training, testing, and validation is revealed by the classification findings. In order to overcome the drawback of relying on human assistance, to continuously monitor suspicious actions to make it easier to handle a large network of police investigative tools. Neha Sana Ghosh, Anupam Ghosh,[8]This study uses supply regression, supply regression CV, and random forest rule to categorise six common human behaviours: walking, climbing stairs, sitting, standing, and lying.We can investigate how people behave and how they intend to fit into their social environments computer programme that tracks human movement and collects background information via smartphones. In this case, activity attention data is thought of as a public store.ANYANG, WANG KAN,[9]This study uses supply regression, supply regression CV, and random forest rule to categorise six common human behaviours: walking, climbing stairs, sitting, standing, and lying. We can investigate how people behave and how they intend to fit into their social environments thanks to the creative use of computing,computer programme that tracks human movement and collects background information via smartphones. In this case, activity attention data is thought of as a public store.AbdullahAlFahim and Ki H. Chon, [10]in this paper,the six daily activities from the UCI HAR data set are used to evaluate the model..The input sides are arranged into one in all kind classes using a large neural network with four hidden layers. Their plan approach outperformed the majority of other ways despite employing fewer alternatives than current modern strategies, highlighting the significance of proper work determination. A neural community model that categorises human activities using activity-driven, manually created replacements

III.PROBLEM STATEMENT

The main goal of this paper is to design an effective sensor-based human action detection system that takes advantage of form attributes. Numerous researchers have created systems for detecting human action, provided cutting-edge algorithms, and carried out controlled trials on different datasets while accounting for precision and estimates.The methods now in use aren't precise enough due of assumptions about environment, view angle, and clothing.

IV.METHODOLOGY

The act detection process consists of multiple steps. Deep neural networks, the Internet of Things, accelerometers, cellphones, high-quality watches, and other technologies are used in act recognition. This research may show how to combine technology that would facilitate the improvement of treatment and pave the road for its modification to better suit persons with different health profiles.

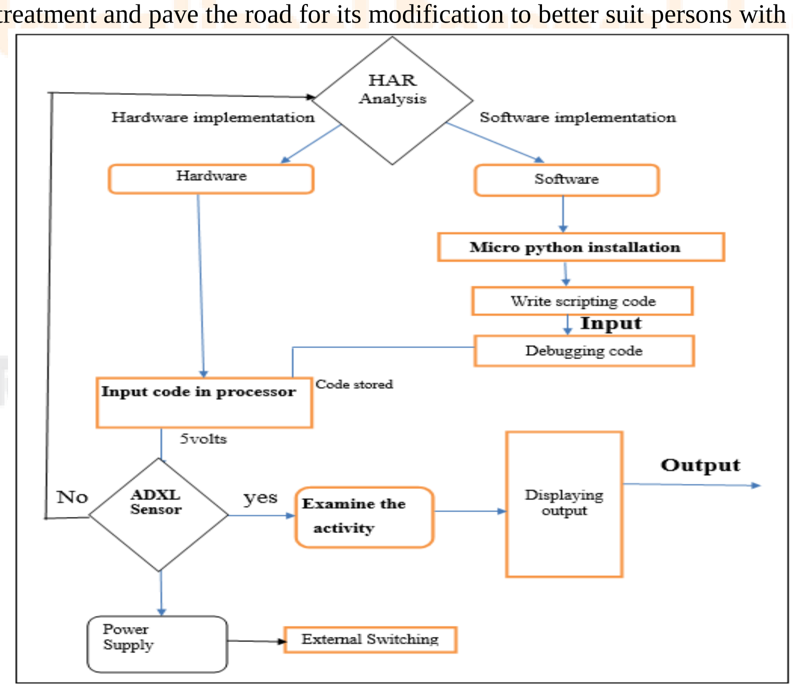

Figure 2Methodology for HAR

The system code's taught commands are amended to take the substitute patient's disability into account, and new knowledge values are established for certain angles. This modularity feature enables the MEMS device's resistance to be changed for every type of bending

angle. This modularity feature enables the MEMS device's resistance to be changed for every type of bending angle that might make it easier to enhance the standard of care.
The methodology from the proposed system is illustrated in figure 2 above

A. ARCHITECTURAL DESIGN

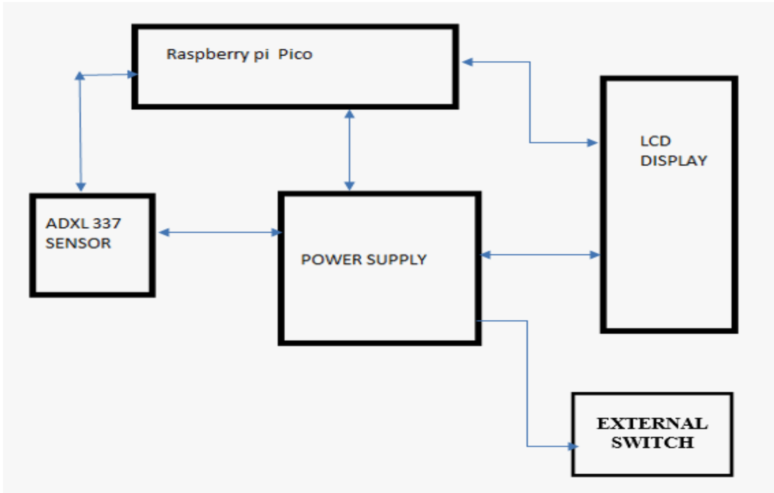

Figure 3: block diagram of system hardware design

Figure 3above system design and diagram make use of a complementary measurement tool.
The measurement device is made up of multiple blocks with resistors that are positioned approximately. The resistance values of a mems device fluctuate with the bending angle. For a specific angle, a mems device can display a precise pricing. Those mems sensors are each currently connected to an input pin on a Raspberry Pico board. On each input pin, a mems sensor is present. Two 5V batteries are used to power the Raspberry Pico board. The edge depends on where the object is in reference to gravitation on earth. After detection is made, the system shows the output pricing on the 16*2 alphanumeric display.

B. IMPLEMENTATION

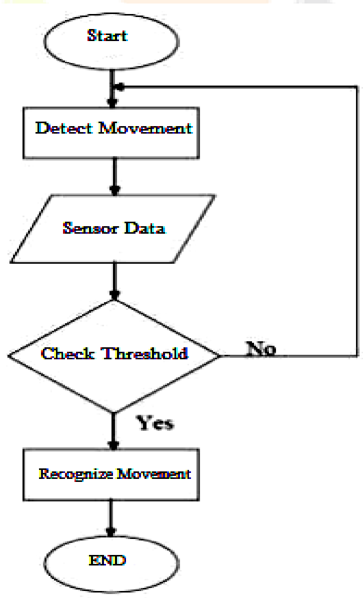

Figure 4: flow chart for HAR

Here from the figure 4 we implement the following, Obtain movement data from the Mems sensor using the hardware of the Pico Board, Convert analogue data into digital format after reading it, Evaluate data against threshold values and human behaviors into walking, sleeping, and other categories.

i)Detect and check data threshold values

Get movement information from a Mems sensor using the hardware analogue input on a Pico board. The raspberry pi Pico will receive the readings from the three axes of the accelerometer sensor through analogue pins.A full 3-axis acceleration measurement tool is the ADXL335. Applications that use tilt- and motion-sensing hardware are how we get the data.

ii)Compare values with threshold values

Dependence of the sensor value to system threshold value on each other, Compare values with threshold values. For the movement of human actions, a system's threshold values will be fixed. These threshold values are used as a comparison point for the sensor readings. The ADC functions flawlessly with these sensors.

If X-value is greater than the fixed value, the Activity should be displayed as "Sleeping." The Activity should display as "Fall down" if the X-value is less than the fixed value.The Activity should be displayed as "Running". The values of the system threshold are fixed because they cannot be changed while the system is sleeping, though they can be changed if necessary from the Thonny IDE.

iii) Detecting Activity for HAR

The available Ports on the controller are then used to send the processed output. The display that was made on the LCD screen. As a result, both the system's threshold and the sensor can detect human activity as activity detected .It often create.py text files and run them on the Thonny IDE MicroPython device to run the code. This procedure is comparable to what Python would allow to perform. One of two methods will be used to send the files to the board:

Compare values with threshold values, for the movement of human actions, a system's threshold values will be fixed. These threshold values are used as a comparison point for the sensor readings. The available Ports on the controller are then used to send the processed output. The display that was made on the LCD screen. As a result, both the system's threshold and the sensor can detect human activity as activity detected.

V.RESULTS

1. Home page of Thonny IDE software

Figure 5 home page of Thonny IDE

This is the step to implement the project,we see the home page as shown in figure 5, an untitled empty file appeared on screen, and here to create our scripting code and Run the file to clear the errors before saving or storing it in the Pico board.

Figure 6: LCD display after power supply for Human Activity Recognition

- This after we supply the external power to the power which is used for the system.
- The LCD display can be seen in Figure 6above once the system has been powered by a power plug.
- A message with the words "Human Activity Recognition" then appears, as seen in Fig. above by means of this sensor.

- Here we need to detect the activity or to recognize the activity for the safety of the elderly or the needy one.
- Thus the display of the system shows the recognition of human activity.

4. Reading the digital numbers for running activity

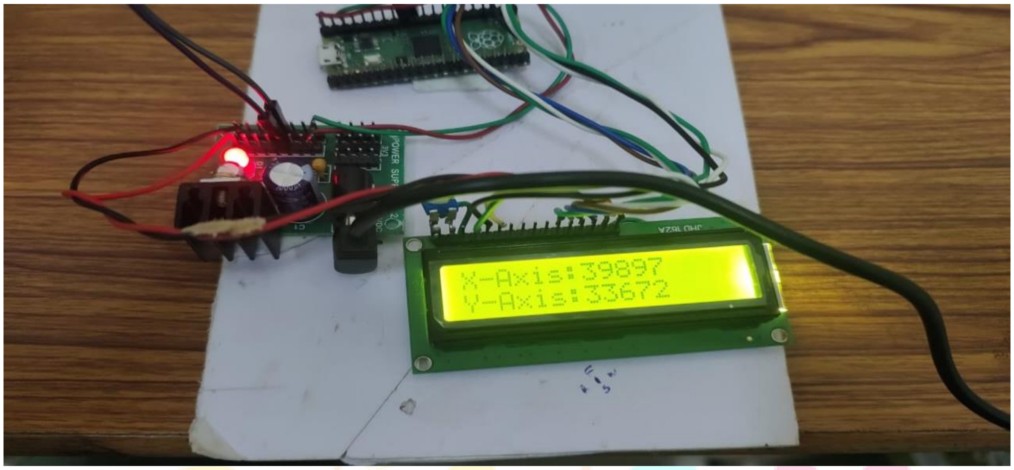

Figure 7: reading the analog values for running activity

- As we can see ,The x-value and y-value which stated in Figure 7 above are displayed on the LCD and are read as digital values on the x-axis and y-axis, respectively:
- As it is fixed threshold value for the system that X-value is greater than the fixed value must be "Sleeping "and also X_value lesser than the fixed value is "Fall down", and Y-value is greater than fixed value must be "Running "and also Y_valuelesser than fixed value is "Walking", so we get X-axis reading as:39897 \sY-axis:33672,
- So it indicates the obtained reading is "sleeping from the figure 7 above.
- When the reading is complete, it displays the action that was taken with the sensor by the user.

CONCLUSION

The main objective is to create a sensor-based human action detection system that works well and makes use of form factors, uploads code to a Raspberry Pi Pico board, and generates observable results for Human Activity identification.The LCD displays, which depict walking and sleeping, respectively, demonstrate that the activity or motion generated by the sensor is that of a human engaging in the relevant activity. The Mems sensor can receive thanks to the combinations and permutations of hand movements, there are an infinite amount of possible inputs.

FUTURE DEVELOPMENT: The concept can be improved by incorporating more long-range Bluetooth devices or by connecting the entire system to the internet so that smart phones can download applications for monitoring the patient's development. As a result, the type of algorithm used in this project can be altered in a variety of ways with ease.

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