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Design & Development of Human Activity Recognition using Mobile Sensors

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ABSTRACT

Human activity detection is widely used in clinical activity and person identity systems. In this project we have developed a vigorous function detection system based on smart phones. This method uses a three-dimensional accelerometer for smartphones as the sole sensor for recording time series signals, resulting in thirty-one features in the time and frequency domains. The activities were performed with 4 different learning methods, namely h. The classification is classified using the nearest K-neighbor algorithm, the support vector machine, and the structural neural network. There is an increasing need to understand human activities in support of health care, especially the elderly. If sensors help healthcare professionals to monitor and monitor patients at all times, healthcare professionals can save huge amounts of resources by automatically reporting when abnormal behavior is detect.Many studies have recognized the performance of sensors with less error rates, but most of the work are done in labs with few systems. There are low error rates in reading from various sensors connected to the body, but no complex configuration is possible.

In this work, commercially available low-cost smart phones are used as sensors to detect human activity. According to the Research gyroscope can assist in determining function, although its role as an accelerometer is no better. Since gyroscope is not readily available as an accelerometer in smartphones, our system uses measurements from a 3-D accelerometer.

Our objective is to use sensors to predict what a person is doing using the motion track. Sensors are often on a cell phone or shirt and often store accelerometer data in 3-D (x, y, z). It focuses on how the user can detect certain types of human functions based on the acceleration data i.e generated by the Cell phone.

Keywords: Human Activity, sensors, accelerometer, gyroscope, Smartphones, Algorithms.

I. INTRODUCTION

The need to understand human exercise has expanded in the healthcare industry, particularly in the areas of long-term thinking, recovery support, diabetes and subjective issues. If sensors are able to detect and inspect patients and report them naturally when undesirable behaviour is isolated, there are many assets to be avoided. Various applications, for example, benefit from human-like structures and status indicator research. Most tests have found effective use of versatile sensors with low blend rates. However, most of the above works take place in research centers with regulatory bodies. The deliberate properties of some of the sensors attached to the body cause a low burst rate, although calibration and ambiguity are beyond their scope. In this work, money effort is used as sensors to differentiate human effort as the minimum effort cell phones can access. The growing ubiquity and intensity of cell phones make it an excellent choice for non-nasal sensors connected to the body. As suggested by Insight for Cell Approval in the United States. In the United States, about 442,011 cell phones and 96 recession sensors, for example, have introduced an accelerometer or whirlpool. Research shows that the coupler helps detect action even if it is not in the same class as the accelerometer. Since the handheld accelerometer on the cell phones does not open as effectively as ours, our framework only uses programs that come from a three-dimensional accelerometer. Unlike many previous work, we unravel the barrier connecting the sensor to the steady state of the body in the direction of the gadget. In our study, the phone can be placed in any dimension around the middle, for example the B coat pocket and the pocket pocket in any direction [1].

These are the most widely recognized places where individuals wear PTAs. The production process is constantly needed when another process is added to the structure. Due to the diversity of sensors, it is important to create and modify the parameters of a single calculation if the calculation is away from the different gadgets. However, naming information about the term system is a smooth process, and customers do not need to identify all product information. Following that, we propose to use the task learning method to accelerate the product process. When looking at classification, dynamic adaptation knee inquiries learn examples of inconsistencies and the exact marking parameters that the common human protagonist responds to. In these ways, customers only name the examples required for the calculation and reduce the total number of design products required. There has been no previous investigation into the use of dynamic action to identify the problem of human activity. The goal of this initiative is to create a lightweight and accurate framework for cell phones that differentiate human activity. What's more, dynamic realization models are built to reduce the time and effort required to mark. By testing specific learning scores, we have made a finding that is consistent with our framework on the effectiveness and accuracy of cell phones [2].

II. LITERATURE REVIEW

In human activity detection systems, various low-level features have been introduced to describe operational considerations using the same technology. In addition, they have no limit, which can be supplemented by our research work.

Stephen Onika and. Al., (2014) introduces the development of a system that allows us to be as familiar as possible in a familiar environment. They used IoT technology to obtain patients' status in real time or to obtain critical data to assess for later clinical diagnosis. He has demonstrated his position on the development of a smart and supportive environment, human activities and health monitoring system, ancillary and telephone robot, and associated assembly, including related services and cloud services. They use the ChipKit Max32 Microcontroller Development Board, 3 Axis Accelerometer Sensor, Heart Rate Belt Sensor and Communication Module.

Minimal-Seoul Guan and. Al., (2018) proposed a human activity detection system that collects data from an off-the-shelf smartwatch and uses an artificial neural network for classification. The proposed layout can be improved by using location information. They considered 11 activities, including general and daily activities. In this study, he proposed the EAR method of collecting data from an off-the-shelf smartwatch and using an artificial neural network for classification. Smart watches are wearable devices that are efficient and easy to use in green settings. [4]

Diego Castro and. Al., (2017) used machine learning algorithms to determine the performance of four predefined types (lying, sitting, walking, and walking). Meanwhile, using remote monitoring elements with remote visualization and program alarms, it is capable of responding to and during operation. [5]

V. Padmanabhan and others participated. Al., (2014) proposed a new method of artificially speaking oral speech to the dumb. Sharing their ideas with others helps them a lot. Some people can easily access information from their goals. The rest didn't understand the news. Introverts are introduced to the dumb to eliminate the problem. The system depends on the operating sensor. For dumb things, they have an object for every move. That message is placed in the database. Similarly all templates are kept in the database. The template is delivered to the database microcontroller in real time and the motion sensor is in their hands. Operating processors speed up each process and signal to the microcontroller. The microcontroller matches the speed with the database and generates the speech signal. The output of the system uses the speaker. [6]

III PROBLEM DEFINITION

a) Health and fitness monitoring.

They play an important role in monitoring the nursing home (in social housing) for the elderly for a continuous and discreet evaluation of mobility and walking speed in the home.

• This reduces the causality based on the assessment of the risk of falling in the elderly.

• Falling (forward / backward), legen lying down, no movement, -raising hands

b) Security and surveillance:

• Contextual computing to support people with cognitive disabilities

• Uninterrupted provision of services depending on the position and activity of the people.

IV METHODOLOGY

1. Data Collection : Data should be collected using accelerometer sensors which is inbuilt in smartphones.

2. Pre-Processing : Pre-processing the raw data , then normalising raw data , filtering raw data , andeliminating data feature.

3. Feature Extraction and Selection : The data will be selected and extracted on the basis of many features like mean,energy , correlation , velocity , acceleration and frequency.

4. Learning and classification: In this phase , supervised machine learning classification algorithms like CNN algorithms.

5. Recognizing Activity : Data will be compared with the plotted graphs, and accordingly recognize the activity .

V. PROCEDURE

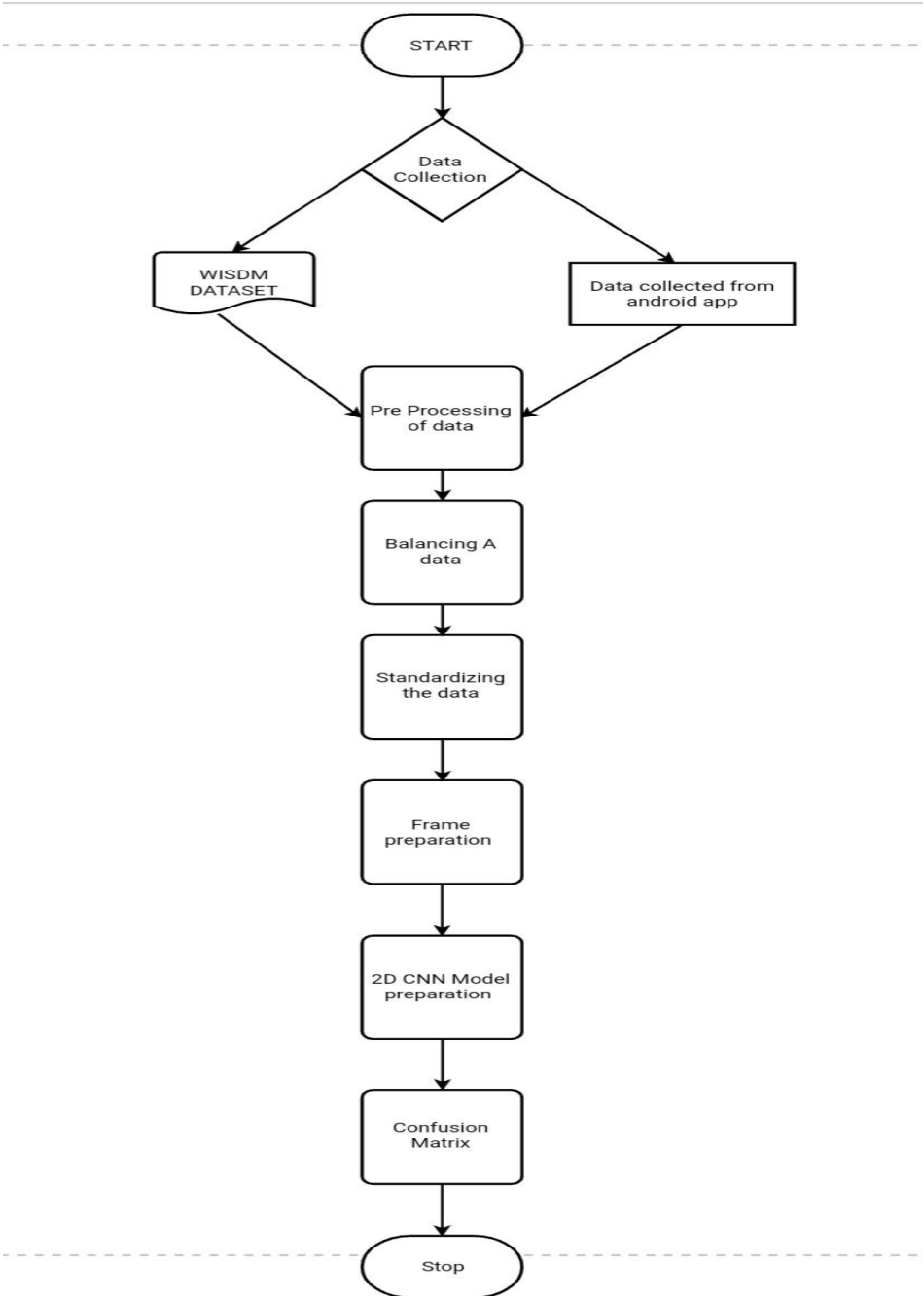

Figure 1: Steps followed

There are different step as shown in above figure 1, to implement this work as given below.

(i) Collecting DataSet

Data collection can be done using accelerometer sensors which is inbuilt sensor in smartphones using different application or software such as

•Androidstudio:

(https://developer.android.com/studio?gclid=Cj0KCQiAtrnuBRDXARIsABiN7ASCTVDmEjk3ex9KWMS4gpIxaaN4eD9fQLgyD6qinm9gJiwnQDgvpIaAplFEALw_wcB)

•Physicstoolboxaccelerometer:

(http://play.google.com/storing/app/info?id=com.cgrydtianvieyra.android1.physicstoolboxaccelerometer)

(ii) Pre Processing Dataset

Pre-processing the raw data , then normalising raw data , filtering raw data , and eliminating data feature.
Data pre-preparing is an data mining method that includes changing crude information into a reasonable configuration. Certifiable information is regularly fragmented, conflicting, and ailing in specific practices or drifts, and is probably going to contain numerous mistakes.

(iii) Balancing a Data

In this project, the data used is Unbalanced so we balance the data . Which simply means the data for walking is 4.4 percentage of the data so we take same number of Data-set of all the activity to train our software.

(iv) Standardized Data

Categorizing takes a different set of unlabeled data and augments with meaningful tags which are helpful and Standardizing the DataSet. In this work , it refers to issuing of new ID to the activity.

(v) Frame Preparation

The preparation of Frames for the Data Set to create the 2D CNN model and confusion in this step.

(vi) 2D CNN Model

Here it depicts the input and output in the form of 2D CNN Model.

Therefore , the CNN model of model loss and model accuracy is plotted according to the gathered DataSet.

VI. RESULT AND DISCUSSION

As per result, we appreciate that CNN is better than the decision tree because:

• CNN builds its own properties from the raw signal. Other algorithms use vector representations in which each component is generally useful.

• Use an infinitely strong background. This is a main feature of max poolinglayer. A good generalization and variation of local fluctuations make them super scalable.

• CNNs are based on spatial characteristics. It can be its strength when the context of the functionality is local, and it can be its weakness when the context is distributed

• CNN stores much more information than parameters than other methods.

The following table 1 & 2 are the comparisons of CNN and Decision Tree with respect to different activities for Unbalance as well as balanced Data

Activity	CNN	Decision Tree
Walking	0.80	1.00
Upstairs	0.83	1.00
Standing	0.94	0.86
sitting	1.00	0.57
Jogging	0.98	0.92
Downstairs	0.73	0.62

Table 1: Unbalanced Data

Activity	CNN	Decision Tree
Walking	0.67	1.00
Upstairs	0.61	1.00
Standing	1.00	1.00
sitting	1.00	1.00
Jogging	0.94	1.00
Downstairs	0.83	1.00

Table 2: Balanced Data

VII. FUTURE SCOPE

Recognising human activities via mobile phones can help in understanding the behaviour of the humans at various inspects , it can be used to analyse the growth of a particular person in sports performance and movements of a person.

Now we have use this system for monitoring the old people but in future we can use it in zoo using only sensors and keep eye on activities of the animals, we could easily find if any animal has fallen somewhere or got an injury and can react immediately to that.

A small accelerometer sensor can also be added in children costumes so we can keep eyes on activities of our children.A person can never have eye on their child every time , a sensor analyzation can help us understanding the behaviour.

A 3-D statistic study can also be done on different people behaviour and performance to predict their capabilities and stronger aspects of life.
With machine learning we can explore and create stats from a large dataset so it will be easy to analyse and do study at large content.

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