# The Taxonomy: Health Monitoring System Using Machine Learning Techniques

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***Abstract-*** **In this paper patient health monitoring system using the machine learning techniques is studied. wireless body area networks (WBAN) is a network which provides continuous monitoring over or inside the human body for the grate time and it holds the transmission real time traffic such as the information, sound, video to observe the status of the basic organs functions. For the soldiers health status we use some bio-sensor systems which comprise various types of the small physiological sensors. In this the ability to track the location and monitor health of the soldiers in real time who become lost and injured in the battlefield. For the soldiers health monitoring k-means clustering algorithms are used. K-means clustering algorithm is the one of the method of the machine learning. By using the k-means clustering algorithms the collected data will be uploaded on the cloud for the data analysis and the predictions. In this two new systems that deal with the large amount of the data and solve the main problems in the current monitoring system. In the current monitoring system in ICU has the many issues to detect real states of patients namely critical and normal states. It frequently generates the high number of the false alarms having the bad effects on their working conditions. These false alarms can threat the patient life and misleading the medical staff. To avoid this problem support vector machines (SVM) namely LASVM and ISVM techniques with the k- prototype clustering methods.**

***Index terms-*** **WBAN, Intensive care unit, SVM,K-prototypes**

## 1. INTRODUCTION

In the current's world the important factor is the nation's security. One of the important and major role is placed by the army soldiers. There are many factors are there referring to the safety of the soldiers [1]. So for soldier's security purpose many mechanisms are built on them to view their health condition and their real time locations. So the soldiers must integrate with the advanced health monitoring system. The control unit to send and receive the information using the real time GPS (global positioning system) and data communications [2]. The soldier must require the wireless communication networks to communicate with the control unit and side by side military personnel. Then the solider must need safety to protecting himself with the advance weapons. Then secure purpose in this paper we use the bio-medical monitoring sensors and mechanisms are combined with the soldier. The integrated components must be light weight and requiring low power. Then the fundamental challenging, in military actions the soldiers are the not adequate to conversation with the control unit. Then the correct navigation is plays an essential part between the position of the soldiers and the control unit. So the work concentrate on the routing the system location of the soldier using GPS (global positioning system) then it is more useful for the control unit room station to identify the exact positions of the soldiers and accordingly they guide them. Smart bio-medical sensors are combining the Pulse sensor, ECG module, Heat sensor and Moisture sensor, bomb detector etc. these all sensors are attached through the LoraWAN (long range wide area network)[3].The LoraWAN module is low-cost, low power and protect the conversations and these sensors are linked through the WBAN (wireless body area network). The steps of producing two efficient monitoring techniques in the intensive care unit (ICU). We introduce two modern techniques that contract with huge data sets and clarify the essential complications in the current monitoring arrangement. The present control procedure in ICU has many issues to encounter real states of patient's namely critical and ordinary states [4]. In ICU frequently develops the collection of the unfounded alarms having the wrong

effects on the working conditions then these false signals can threat the patient life misleading the medical staff then to fend off their false alerts in the ICU we apply the patient life misleading the medical staff then to fend off their false alerts in the ICU we apply the machine learning techniques have successfully escaped the issue of the huge degree of the unfounded signals. By SVM (support vector machine) techniques KP-ISVM [5] and KP-LASVM [6] with the K-prototypes clustering procedures. The statistics assembled at the base station can be controlled for better prediction utilizing the K-means clustering algorithm. The WBAN sensor mechanisms are found poorer than the WSNs for the reliability, node complexity the quantity the WBAN nodes are universal but the WSNs are present not accept unique specifications combined with the communication between the network and the human body [7].

## 2. WBAN ARCHITECTURE

The WBAN is constructed with the specific purpose sensor which can individually associate with different sensors and materials located at the interior and outside of a human body. The simple WBAN system is divided into the several groups. Here we have the varied the structure development into the four categories. The initial group is the one of the WBAN part which subsists of several sets of sensor nodes. These nodes are the economical and nominal-power nodes with inertial and the physiological sensors. They are strategically located on the human body. All the sensors can be studied for traditional conduct of the develop, healthy stipulations like the heart rate, ECG, blood pressure etc. and the nearby ecosystem there are great control activities are being conducted already based on the wired networks. Any stranded communications in a control procedure can be ambiguous and difficult born by a somebody and could restrain his flexibility. So the WBAN is a particularly impressive result in this area mainly in a healthcare process. Where the patient requires to be controlled constantly and requests the flexibility. The second category is the co-ordination node where the full sensor nodes will be instantly attached with a distribution node identified as Central Control Unit (CCU) CCU takes to the authority to gather the message from the sensor nodes and to communicate to the later category for auditing the human body activities there are no such wireless technologies is specified for training the WBAN. The most popular wireless technologies needed for the therapeutic control operations are WLAN, Wi-Fi, GSM, 3G, 4G (Bluetooth, ZigBee) etc[8]. these all technologies are generally possible for small distances communications.

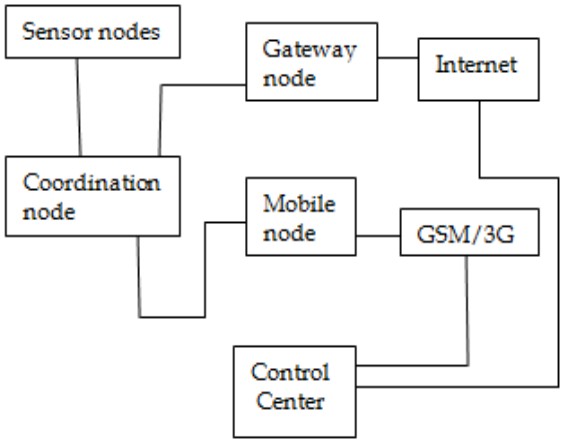


Figure 1 WBAN Architecture

The third group is the WBAN conversations which will work as a gateway to take place on the information to the point the mobile node can be gateway to a remote point to operate the mobile information to an organic process using GSM/3G/4G. The router or a pc can be a remote node to connect via Email or alternative work using Ethernet. The fourth section will be a force center subsists of the produce node materials such as mobile phone for information, pc for the monitoring and information technology and attendant for accumulating the message in the database.

## 3. SOLDIERS HEALTH MONITORING SYSTEM USING K-MEANS CLUSTERING ALGORITHMS

### 3.1 soldiers system

This system consists of body area sensor organizations such as heat sensor, heart pulse sensor, moisture sensor, pulse sensor, GPS and bomb detector. These sensors are needed to understand the strength restrictions of soldiers, recording their location and to detect if there takes been a bomb detonation nearby tracing explosive compounds in the ecosystem. The sensed analog warns will be converted into digital signals using analog to digital converter and later matched with the routine restrictive signals. If any error exists between

perceived signals and established ordinary warns, thus it will be dealt with as a necessity. The value of card device radar has likewise been recommended in this report to identify the presence of any powdered compound in the environment near. The soldier's unit shall have a ZigBee measure that will be utilized for communication between the soldier and the various squadron commander [12].

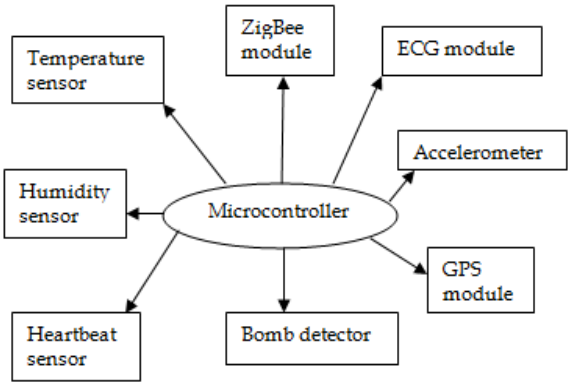


Figure 2 soldier's unit

3.2 control rooms system

The army base service system or the management group shall dwell of a PC and a LoRaWAN transceiver element which will be attached with each alternative. The data arriving from LoRaWAN section will be performed on PC evaluate with the support of graphical user interface (GUI) or a network portal.

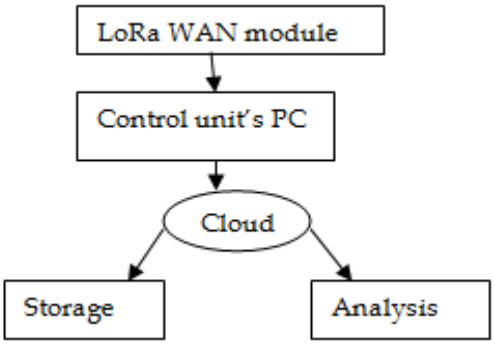


Figure 3 control rooms unit

3.3 Network architecture

A ZigBee transceiver is needed to transfer the data, getting from sensors and GPS receiver through microcontroller, to the squadron commander using wireless transmission[13]. A ZigBee is little yield, moderate energy, wireless mesh network test specifically worked out and produced for high battery generation strategies in wireless managing and control operations. ZigBee methods have little latency which can better undermine the average streaming. The squadron com-mander is hooked up to the deal with group operating Lo-RaWAN which facilitates the transmission between both sides. LoRaWAN can be applied in large elevation warzones where cellular system analysis is either empty or appears not provide data communication. This report moves up with a solution of recording the soldier since well as to provide the strength situation of the soldier during the go to war, which sets up the battalion organization to work out the war policies and anticipating the war conditions applying machine learning.

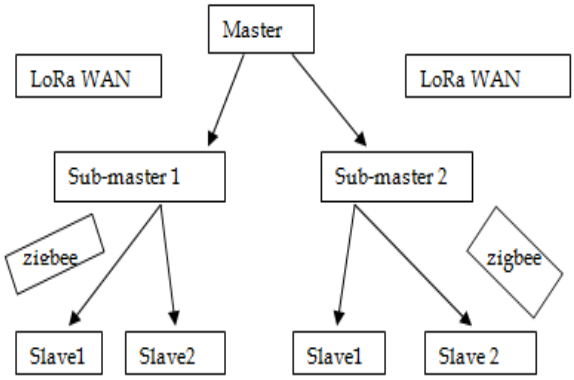


Figure 4 Master-slave network architecture

3.4 cloud infrastructure

ThinkSpeak has been designed to be adopted as the IoT-based Steam Program for the precursor design. It provides free data cache and evaluation of present-etched numeric or alphanumeric data. ThingSpeak library enables an Arduino or other appropriate hardware to record or translate data to or from ThingSpeak.

It is a clear information program for the Internet of Things (IoT) with MATLAB analytics and data image. It enables sensors, materials, and sites to move data to the steam where it is deposited in either a confidential or a national transport. Data is locked away in separate carries by delinquency, but national transports can be operated to distribute data with alternatives. Later data is gathered or uploaded in a Thing-Speak transport, it can be determined, anticipated and received on social mechanisms, network works, and new materials.

3.5 Machine Learning method

From the sensor data gathered on darkness like – cold, moisture, heartbeat sensor observations will be developed applying K-Means Clustering. It deals with the issue of individual training as any word or judgments about the relationships between various factors that we are assembling is not applicable forehand. . From the observation data of various sensors, for special cases or things like going, running, resting, in process of air attack, suffering; each cluster calls these extraordinary actions based on the data gathered. The accompanying are the treads of K-Means Classification:

1. Data Assignment

Each centroid represents one of the flock. In this tread, each data situation is handed over to its dearest centroid, based on the rectangular Euclidean distance. More correctly, if is the number of centroids in set C, thus each data position x is handed over to a flock based on:

$$\arg_{ci \in c} \min dist\,(Ci, x)^2$$

Where, dist(ci,x) is the ideal Euclidean distance. Let the collection of data limit appointments for each $i^{th}$ bundle centroid be Si.

2. Centroid Update

This stride, the centroids are recomputed. This is given by getting the miserable of all data positions allocated to that centroid's flock.

$$C_i = \frac{1}{S_i} \sum_{xi \in S_i} x^i$$

3.6 system model

All the sensors such as Heat sensor, Moisture sensor, Heart Beat Sensor, Accelerometer and GPS section along with either ZigBee Sector or the LoRaWAN Section are combined with the Arduino Mega 2560. Every soldier in the battleground is presented with such design where different sensors' absolute point data along with the soldiers' situation are assigned to the battalion commander from the soldier operating ZigBee factor and the data obtained by the battalion commander is assigned to the steam through the LoRaWAN section as it relieves high area information and still true connection. Data analytics helping K-Means Clustering is employed on the collected data on the vapor to hand over instruction about the soldier's system such as if they are attacked, damaged or if they have disappeared. The present war scheme along with the condition of the soldiers opened on the wrestling pick up can be considered through the network portal and then it would be still serve the headquarters in agreement making.

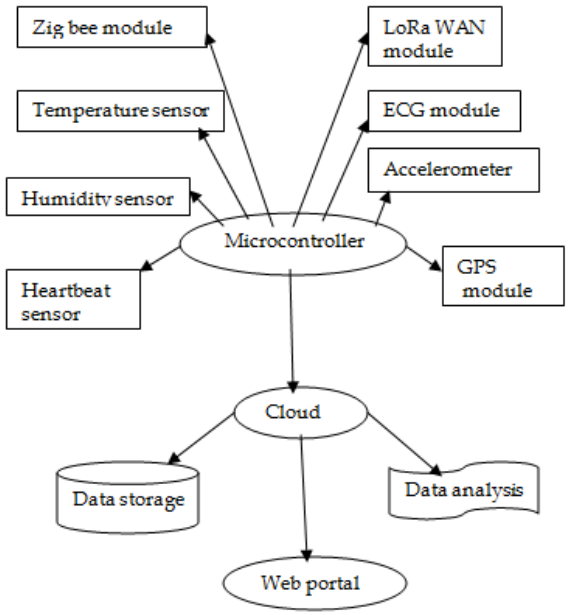


Figure 5 block diagram implementation of the prototype

## 4. HEALTH MONITORING USING K-PROTOTYPE CLUSTERING METHODS

Control patients in the intensive care unit (ICU) is the essential task. There is a special technique in the emergency room called control technique which observing the patients with the dangerous specifies the observing structure in the ICU measures several therapeutic frameworks. Then each acted framework involves a specific threshold indicating the state of the condition of the patient. If the amount of the specification exceeds its sets a signal is trigged. In the clinics the therapeutic staff the trigged alarms as recognized as the symptom of a precarious state. Then as the result of that this patient has requires an urgent therapy. However not all trigged panics are the resemble to a serious state there are many incorrect alarms and the observe operation can misrepresent the therapeutic staff in the clinics.

4.1 clustering methods

4.1 The K-prototypes Method

The k-models is a partitional clustering technique suggested in by Huang for mixture data i.e. absolute and numeric data. It is a conversion history of the k-factors approach. The k-models method[19] employs two copies of distances between traces. The euclidean distance for numeric traces and the simple matching dissimilarity measure applied between definite attributes. Assume we have two objects X and Y with mixture attributes' values i.e. numeric and definite. The dissimilarity d(X, Y ) between these phenomena can be attained employing the succeeding formula:

$$d(X,Y)=\sum_{j=1}^{p}\left(x_j-y_j\right)^2+\gamma\sum_{j=p+1}^{m}\delta\left(x_j,y_j\right).$$

With p and m are properly the amount of numeric and absolute attributes and γ is a substance needed to not accepting any type of associates. In our practice, we come up with to apply the k-prototypes approach to gather cases including numeric and categorical measured costs relative to preventive frameworks. The clustering comes from will be groups patients having the same diseases.

4.2 Monitoring Process Based on Machine Learning Techniques:

In analysis system we have to adapt of a work out set before setting up the classification of the sufferer gives, which is unacceptable in our therapeutic process. To sidestep this complication, we propose to set up a general classification design based on incremental SVM for each group of patients. In place to obtain these gathers, we need the k-prototypes clustering method described in the preceding chapter[20].

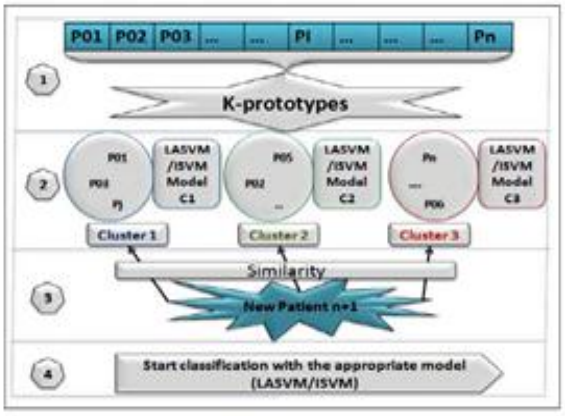


Figure 6 the steps of the proposed approach

From this model, we can identify the four strides required by our current method.

1. Original, we need the k-prototypes clustering method to set up groups of related patients (sufferers who go through from related disorders).
2. Again, we need the incremental SVM method to bring about a general model for each meet of sufferers. This design will represent all sufferers existing to the same arrange.
3. After that, we add a recent controlled patient with new qualities of associates.
4. Already, we can simply and efficiency divide the contents of this sufferer by adopting the most similar design to it. Indicate that this design is appointed after computing the coincidence between the current sufferer and all meets and finding the appropriate group of this patient. These are the treads of the K-models gathering techniques to set up the complementary arrange of the parents. Thus we have to accept some recommended rules.

## 5. CONCLUSION

From the Above three papers the authors are more focused on patient health monitoring with machine learning techniques. K means Algorithm and SVM are used for analyzing the data and it is observed that SVM provides better results when compare to K means clustering. Body Area network is deployed to transfer the data easily and Lora is used for long range communications This system helps them to monitor the health parameters of soldiers track their positions detect near by the bombs and predict the warzones environment using the various sensors and k-means machine learning algorithm. And we focus on the problem of the monitoring system in the intensive care unit. Then we use the two new monitoring systems KP-LASVM and KP-ISVM combing the LASVM then the ISVM with the k-prototypes. By using these algorithms we reduce the false alarms in the intensive care unit in the hospitals.

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