Naresh Rao SS - SMARTWATCH

by Naresh Rao Ss

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SMARTWATCH

Naresh Rao SS & Srikanth S

Department Of Information Science And Technology, Presidency University

Abstract:

Various Inventions of smart device are trending now-a-days, the basic one's which everyone uses in their daily life is their smart mobile phones and others such as smart watch's, smart band's, smart ear-pods which is basically connected via wireless famously known as Bluetooth and Wi-Fi as per the device configuration. Which has become more advantage to track every detail precisely and easily available in stores or online platforms such as Amazon, Croma, Reliance digital or Official website of that brand.

This other can come handy in many ways detecting and tracing as per individual requirement. For each smart device there is a particular use depending on the configuration, operating system and compatibility components.

The need of this research is to bring in new features to the existing version which has been there but was ignored so, I thought to get in those features as I have faced many issues regarding it. Those features are camera, Body Temperature sensor, Contactless payment, additional source of battery and stopwatch. The existing features did not have these features so we have tried to come up with ideas and trying to make things simpler and easy to use with all features in it.

Many of technologies can be used to implement this but I have made use of some of them which can be very much useful for my research on smartwatch.

Important Keywords

- Smart Watch
- Smart Phone
- Features
- Technology
- Detect
- Sensor
- Activity

Introduction:

An information was gathered that there are almost 1914.6 million smart phone users are available and smart watch users survey has to be gathered till date as they are using the smart devices on regular basis. The famous one's in smart phone Operating System is Android and IOS which almost all users avail it as per their requirement. Coming to smart watch Operating Systems Are Wear OS, lite OS, Fitbit OS, Garmin Coach, Tizen, Watch OS. By looking at all of the above OS both in smart phone and smart watch mentioned each has its own pros and cons.

The concept of this had come into picture in 1990s because always carrying a heavy / huge device is not recommended at a long period of time. Smart watch is a device which is reduced in size for comfortable usage rather than carrying massively huge device. Due to research over the past years have made it possible to make this device come handy for every user. This device can do marvellous things if you are particularly looking for this device based on its features and size too matters.

This device come under the technology of **Internet Of Things** which is mainly concentrated on connection, sensors, tracking of the device. It is called smart because it can connect the smart phone via Bluetooth and wi-fi wirelessly. A great achievement by the researches who brought this to the society since then people have been focusing on their fitness goals

like calorie burning and calorie intake which helps them having their physique as in proper shape, moreover it has become a challenge type amongst their colleague on their goals.

Smart watch is basically tied around the wrist. Smart watch has become very useful in term of calculating / measuring fitness routine and many more things such as Heart beat, Oxygen level, Workout, GPS tracking, Stopwatch, timings…etc.

Since I'm a long-distance athlete which includes running and cycling. I think there are few features which all smart watches have been lacking till date. It's because not all athletes carry their gadget during their activity. Athlete have a mindset which is completing the race within the given timings or before that so they keep looking at the timings at regular intervals of times during their race so carrying a mobile phone which is big in size is not actually good because holding it in hand during Full marathon is very difficult as he is tired when he hits the wall which is 30km mark there are lot of changes happening to the body. So, **marathon is not a joke** and has to be taken it seriously not doing silly mistakes during the race and if there is a smart watch which is compact weighing around [1] 60g – 70g maximum rather than smart phones weighing around 160g - 170g and large in size too.

In all the below scenarios the smart watch is a powerful device which can do things within a compact device shape and robust in nature and the user need not worry about carrying the large device all the time. All of these can be done within a smart watch.

My ideology is adding additional features this gadget which becomes even more useful for fitness freaks & other users.

Objective:

- Compact Design
- Features for added benefits
- Flexibility usage in the device
- Portability can carry it anywhere
- Fitness tracking

Smartwatch:

- Smartwatch is nothing but a smart device used by many individuals all over the world in-order to achieve their daily goals such as sports activity and many more things can be achieved using this device.
- It can help us in many ways as there are many research and innovation taking place over the years, when we look back 30 years back there was no concept such as this. As this has been innovated and modified for 30 years, we as users' needs to make use to the things which can get more out of a person's normal capability and features are being developed often and all branded companies come out with different ideology to get the best of best benefit for their customer with limited price band.
- Moreover, it is like a pet always stay around you and checks every moment you do and reminds you that you need to do this at this particular time. It is very much useful to individuals who needs to stay fit and lead a happy life and accomplishing daily goals before a good night sleep and continue the process again the next day, acts as a remainder to tell us that we need to do this at this given period of time similar to pager in late 90s.
- I personally suggested everyone to have one smart watch it makes your life much easier and stay focused and tempt you to do marvellous things to achieve greater heights.

Related Features & Sensors Used :

- Acceleration:

  This mechanism helps us to check the acceleration mainly used when we are running or cycling, it basically calculates how fast we are travelling at that moment.[9] It uses piezoelectric and capacitive accelerometers used to determine the velocity to measure acceleration. Piezoelectric uses single crystals and capacitive uses silicon micro-machine. Now a days they are using MEMS technology which is nano Technology to measure the accelerators.

- Activity:

  This is a menu where all the activity options are available and we can select it as it completely depends on what physical workout activity we do. Such as Running, Dancing, Strengthening, Swimming, Sports. [11] pedometer sensor is used to detect number of steps taken during the workout activity.[6] Gyroscope is used to detect the momentum while a person is running or jogging activity is performed actively.

- Heart Rate:

  This option helps us monitor our heart beat 24/7 and when we set the limit of our max heart beat connected via Bluetooth in corresponding app it will definitely give us a hint when we are having it so that we can be safe and protect ourself from getting heart attack. [10] It makes uses of ECG sensor which is known as (Electro cardio gram) used to detect electric signals sent out by heart after every beat.

- GPS:

  GPS is one of the technologies used most of the time to find direction / route while travelling any known / unknown location and now-a-days we are able to get the location post travel at any location, moreover we are able to get a map file which shows us the location pre-installed before any travel.[8] Initially the signal is sent from smartwatch to satellite and then receive it a particular time this process is known as Triangulation.

- Sleep Monitor:

  Sleep monitor is very important for an individual if that's not going well, he will not maintain a healthy body. Minimum of 8 hour is must for a human being. [6] It makes uses of bioimpedance senor used to detect resistance in skin generating small quantity of electricity.

- Spo2:

  Blood oxygen level helps us to identify how much oxygen is currently available, range of it must be around 90% - 99% to have a perfect oxygen level maintained in a body. [6] It makes uses of bioimpedance senor used to detect resistance in skin generating small quantity of electricity. [7] Takes reflection of infrared lights from blood levels to detect percentage of oxygen present in the body depending upon heart beats.

- Stress monitor:

  Stress monitor tells us that if we are stressed if we are actually in stress, it notifies us to have a walk or drink a class of water and take a break for 5 - 10 minutes. [6] It makes uses of PPG sensor which is known as (Photo plethysmo gram) used to detect blood volume changes in tissue. Which is penetrated through skin and rate of change in light absorption which is infrared light uses photodiode mechanism either transmitted or received. [7] Here it uses HRV (Heart Rate Variabilities) which indicates stress level depending on heart rate

- Torch:

  It is similarly to flash light in smart phone but it is in watch so the smart watch dial becomes completely white screen in case of emergency we can use it.

- Find My Phone:

This can be useful when we misplaced our smart phone device nearby and when it is connected to our phone we can easily find out as it starts ringing. It requires google account user id and password to actually find the phone option in the main menu.

- Music:

  There is music control connected via Bluetooth where all songs are stored in smart watch storage, so no need of carrying mobile all time.

- SOS:

  This feature is also known as emergency option in smart watch which is introduced in recently introduced into latest smart devices. If a person doesn't feel safe, he / she can just click on this option which immediately send an alert to emergency contact / police station.

- Compass :

  Compass is very useful component basically used for adventure trekkers in-case of finding any route in-order to guide them in a proper way. [6] sense the direction of map application used in smart watch. Works with the help of magnetometer with GPS to detect exact location.

- Water Resistant:

  We get water resistant like 5 atm /10 atm which takes 50m and 100m depth for people who do swimming such as under water can go into depth of mentioned above.[12] barometer can be used to sense the pressure under water and detect the exact amount in it.

- PAI Score:

  PAI stands for Personal Activity Intelligence. This an absolute wonderful feature which uses its own intelligence and tells us how much activity is required for an individual to stay healthy. We get it on weekly basics or monthly basics report in synched smart phone.

- Offline Voice Assistant:

  Alexa voice assistant is used in most of the smart watches for having a kind of communication with it, where the user need not even touch his smart watch to click on the content just be telling out the application starts working as simple as that.[13] voice assistant makes use of NLP which is known as Natural Language processing as pre-defined key word in the dictionary and check if that matches the voice heard from an user and given the output corresponding to the keyword the user has spoken.

Proposed Model:

- Camera attached to the smart watch which is accessed by the [1] GPS to reach our smart phones or store it in watch memory which later can be accessed through their official app. where the user in this case in not actively carrying a smart phone just the watch because the user can take picture after any physical activity as a memory or to upload in social media.

- Those features are adding [2] temperature measurement stating that the body is heated up and ready to start the training.

- More-over we can make use of smartwatch as a Wi-Fi Credit card which new technology has be introduced where you just need to place your card in front of swiping machine which read the account number and where we just need to enter our PIN in order to get authorized access and pay the amount for what was purchased. Where we no need to carry card everywhere.
- There is less battery in smartwatch due to small size and there is no additional supply of it so that we can get additional supply through a source mentioned below for detailed understanding for the model.

- Next one is that we set timings for a particular race at every km pace timing measurement. Suppose we have a timing set of [4] 3km race in 15 minutes the watch has to display 5 minutes per km is recommended in order to complete the run within the given time, in case if the runner takes 5 minutes to complete 1km it should show that you have successfully completed 1k in 5 minutes and if he takes 2k with timings of 8 minutes and it should display not completed successfully and he needs to run 3k in 2 minutes to manage the given timings initially.

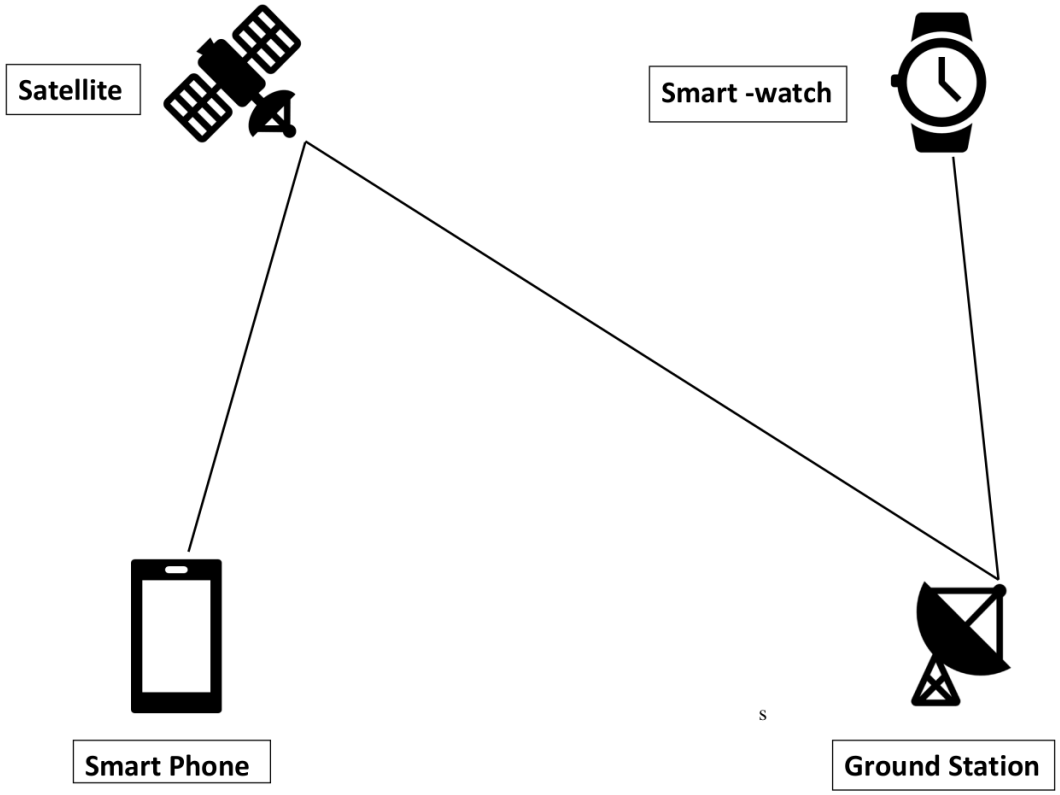
- Camera Working Using GPS:

  - This is mainly used in GPS sensing Technology which is already there in [1] Amazfit T Rex Pro smart watch which is a product of Huami. It has amazing sensing of [1] 3 GPS know as GPS+GLONASS, GPS+BeiDou, GPS+Galileo which is better than any other smartwatch as it has 3 GPS.

  - It shows accurate position where a user is actually is. By this same technology we can use it for camera to take pictures which is sent to the satellite and [1] reflect it back to our smart phone when we synchronize via Bluetooth or we can make use to cloud technology to store the image which is taken store it and retrieve it later when we access our smart phone such as google cloud, mega, one drive and many more cloud storage available in the market.

  - GPS has 3D trilateration and 2D trilateration which can come handy used to check latitiude, longitude for 2 dimensional trilateration and latitiude, longtitude and altitude for 3 dimensional trilateration through which the smart watch sends signal to ground station which is directed to the main satellite to one of the three famously known as [1] Glonass, BeiDou, Galileo. Later when syncing the watch to smart phone we can reterive the images take through the smart watch camera.

  - Below Figure 1 is mentioned for understanding clearly the complete process.



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Author Figure 1 : *Diagram For Image Sending From Smartwatch →Ground Station →Satellite → Smart Phone.*

- Temperature Sensing of Body:

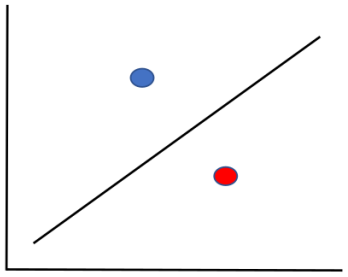
  - This can be used by [2] Digital temperature which is also known as electronic thermometer sensor technology which is used to check the body temperature of a person which using different sensors and detector like solid state sensor, thermocouple sensor, temperature detector. [3] There is also a new nano technology known as DST nano Temperature sensor which weights close to 1.3 grams and 17mm long and 6mm wide which is made by using alumina (ceramic).

  - This also can be retrieved by syncing the smart phone via Bluetooth to get all the details and there also we can make use to light sensing and vibration to give us a hint that's its ready. Here we'll be using 2 colours of led lighting system green and red which basically detects if the body is heated before workout displays green light and if it's not display's red light.

  - Using this when we select the workout option from the menu given in the watch as soon as we click on it we need to stretch or do little bit of exercise in order to get our body heated up as soon as it is heated the live GPS location should start locating us. This is one after the other first temperature check then GPS gets activated.

  - Here we can make use of SVM algorithm which is machine learning technology which can differentiate between 2 terminologies.

  - Below is a rough Figure 2 of the corresponding mechanism.



Author Figure 2 : *Working Of Temperature Sensor using SVM.*

- Smartwatch Wi-Fi / Contactless Credit Card:

  - This is a Wi-Fi / Contactless credit card system which is used most of the time to do any kind of payment. This can make an individual's life much simpler where he need not carry the card anywhere, he goes and won't lose the card often or misplace it anywhere by chance.

  - This can be made using [4] RFID (Radio Frequency Identification Detection) tag to which just scans the barcode and gets the access quickly. The best feature it has is that it can detect the barcode at a distance of 100m far that's amazing, in recent technology development found that NFC (Near Field Technology) is best when it comes to contactless transaction in ranges 4cm which is far better than RFID tags. This works in very simple manner just place your card nearby contactless swiping machine at a distance of 4cm where the details are exchanged between 2 objects and payment is done through it.

  - And there is even Titan watch strap also has contactless payment system NFC to be precise through which we can sync through our mobile app where our card is added and moreover there is no tension of battery doping drastically In smartphone so which much useful feature but there is a flaw in it which is required only SBI account corresponding app is YONO just attach the strap to any watch use it recklessly unless there is any damage to smartwatch device or the strap.

- [4] Maximum amount of payment is only Rs.2000-/- per transaction in case if the payment is more than 2000 you need to do the transaction multiple times depending upon the payment amount. This rule was proposed by RBI (Reserve Bank Of India).

- Simply tap and pay using NFC option in smartwatch before that we need to add the card manually using phone with the card number and entering OTP further syncing the smartphone → smartwatch in-order to get the details entered in smart phone.

- Below Figure 3 is model connection with respect to smart watch and swiping machine.

Author Figure 3 : *smartwatch connected to via wi-fi to swiping machine*

- Solar Panel For Battery Backup :

  - The feature helps us to make use of additional battery if there is less charge in smart watch, we can make use of solar. Mostly we can make use of this feature only morning and charge the battery for the extended usage until sun available.

  - There can be a flaw using only in summer, hence we have come across many watches having these feature already such as Garmin, Samsung, Nosie… etc. If we consider cold season such as October, November, December there is no much sun and we cannot make use of solar radiation to charge our battery rather we can make use of our own body thermal energy to charge the smart watch battery. [5] Making use of thermoelectric generators which can generate electricity basically tied around wrist depending on differential body temperature, but as of now wearing around wrist can produce 20 $\mu W/cm^2$. But if it can cover more area more electricity can be generated. Few areas where heated can be generated in bulk is upper arm, chest and wrist.

  - If we can connect T-shirt with smart watch, we approximately 6 $\mu W/cm^2$ at stationary movement of physical body and while running close to 16 $\mu W/cm^2$ while running and cycling.

  - The T-shirt and smart watch are connected via Bluetooth having transmitter and receiver to get all details how much is it charged. In the above method of temperature sensor, we can make use of this to get the temperature readings in degree Celsius.

Author Figure 3 : *smartwatch generating electricity through Solar panel*

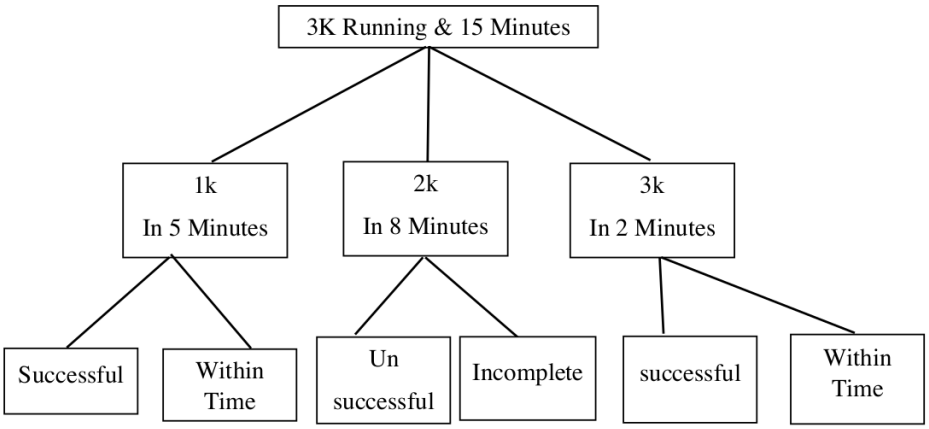
- Stopwatch Timing:

  - Stop watch is very much essential when it comes to measurement of total time or splitting the time in term of lap 1 or more basically the amount of time lapsed from initial time. It has many options in it such as start, stop, restart from beginning and has count down which is reversed manner of time lapsed.

- This can be used to set the timings during the workout to have self-challenging to do even better than what they are actually doing. Using the same technology, we can implement this in different workout modes for different usage such as running per km can be considered as a challenge and while lifting weights can be measured during their sets and rest time.

- Here we can make use decision tree machine learning algorithm which can take decision based on the workout activity choose and time set for corresponding activity.

- Figure 4 is mentioned below for better understanding.



Author Figure 4 : *Working Of Stopwatch using Decision Tree*.

Results:

By using the above-mentioned features can make any individual to handle the things easily and make every aspect easier. Through which the device can be compact in size and weight. Just think a small device can do wonders having many features. Coming to credit cards there won't be any misplace of it it's better to have contactless system which can be much useful. This smartwatch is very much accurately in terms of calculating calories and other measurements. For Safety purpose SOS is activated in case of any emergency purpose.

But looking at this there are demerits too in this such as security for wireless connections. Always smart phone is required at certain point of time to synch the data. As there are many issues regarding battery, we have tried to overcome this possibility mentioned above in proposed model. In fact, due to small screen people with eye issues won't like it much and will feel difficulty to use the product. And smart watch does not get updates like smart phone in regular period so researchers are testing repeatedly on new updates with latest security updates.

Conclusion:

So, the above models of different problem statement mentioned initially we came up with few ideas and technologies which can be useful and can make it happen in the further upcoming years it's a small piece of research through which I went made a survey amongst my colleague and made use of those queries and came up with a plan of introducing it and make something new out of it.

Since I'm a long-distance athlete which includes both running and cycling. I'm very cautious about my health and want to continue it till my last breath also I want everyone to know their body condition well due to this we can easily fight through any illness and stay fit. By getting additional benefits through the technology so called engineers are meant to make new innovation and improvisation to current device for all this to happen which is possible through basic concepts can make wonders to bring forward the impossible ones.

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