Remote Health Monitoring in the Context of Bangladesh

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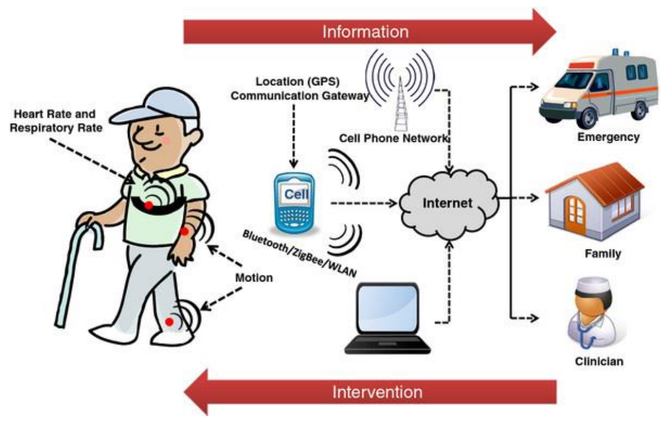
Abstract

- Mass people need medical prescription like everyday needs
- Medical services are not much available in remote areas especially in third world countries
- Most country people cannot afford family or personal doctor for regular check-up
- Many people are not aware of health condition and seeking suggestion from physicians all the time is lengthy process
- In countries like Bangladesh, lacking in medical resources and unawareness costs huge medical expenses in aftermaths

Motivation

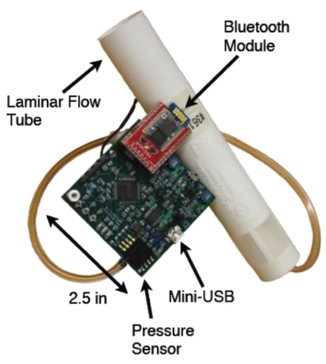
- Bangladesh is a over populated country and needs more medical resources which can be somewhat solved by remote health monitoring
- Smartphone is now spreading among mass people in great extent which is a good medium of remote health and patient monitoring
- Way to decrease huge medical expenses and establish home medical care



Methodologies

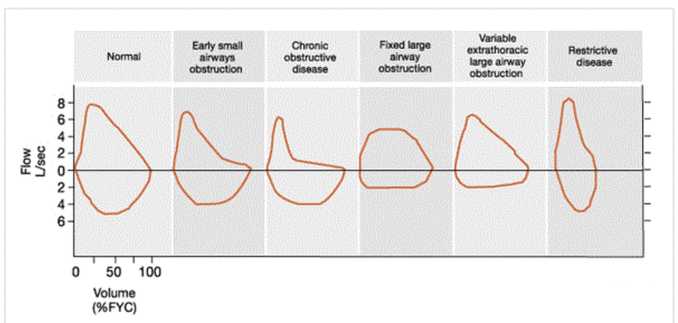
Spirometer

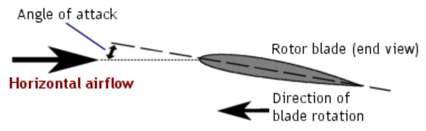
- Spirometer is an apparatus for measuring the volume of air inspired and expired by the lungs
- Spirometer is used for testing of lungs diseases e.g. asthma, bronchitis, emphysema
- Small cost spirometer is connected to smartphone via arduino and HC-05 bluetooth module to send data



- $U = \frac{\pi d_1 N}{60}$
- $\tan\theta = \frac{v_{f1}}{v_{w1}}$
- $\tan\beta = \frac{v_{f1}}{v_{w1} - U}$
- $\Phi = \pi d_1 b_1 v_{f1}$

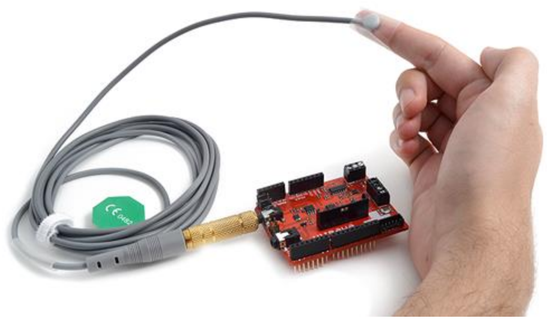
d_1 = diameter of fan
N = rpm of fan
v_{f1} = flow velocity
v_{w1} = wheel velocity
b_1 = thickness of fan

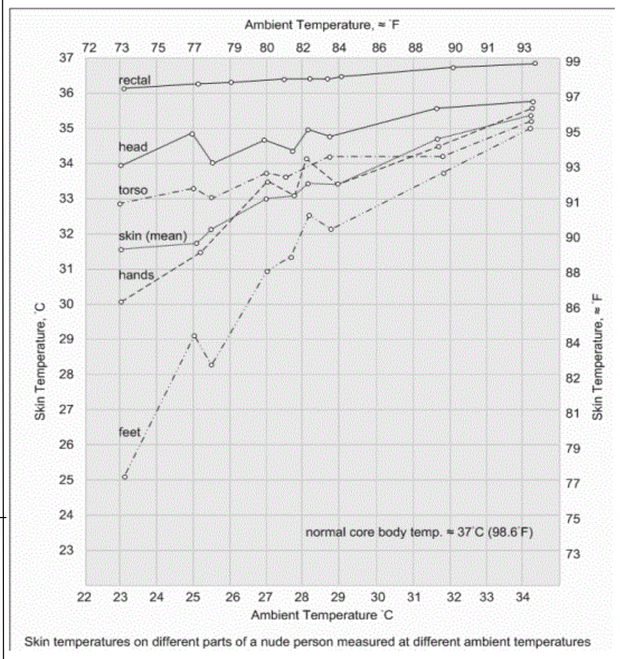




Skin Temperature Sensor

- Body temperature is one of the four main vital signs that must be monitored in a patient
- Body temperature should be measured and recorded regularly with precision, consistency and diligence





Skin temperatures on different parts of a nude person measured at different ambient temperatures

- Thermistor sensor is used which passes voltage through arduino analog pin and then voltage is converted to temperature

- *T = log(((10240000/RawADC) - 10000))*
- *T = 1 / (0.001129148 + (0.000234125 + (0.0000000876741 * T * T)) * T)*
- *T = T - 273.15 (Convert Kelvin to Celsius)*
- *T= (T * 9.0)/ 5.0 + 32.0 (Celsius to Fahrenheit)*

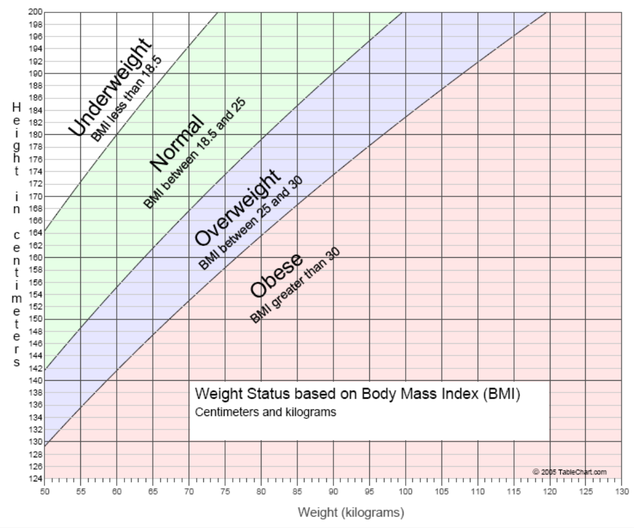
T = Temperature
RawADC = Raw voltage read from sensor through arduino analog port

Heart Rate Monitor

- Heart rate/pulse is the rate of heart beats per second which changes due to different physical activities
- Placing finger tip upon camera + flash of smartphone calculates pulse by image processing
- The app uses the PreviewCallback mechanism to grab the latest image from the preview frame and finds out red pixel values and uses data smoothing to figure out an average
- An average red pixel value determines a heart beat when the average red pixel value is the latest image is greater than the smoothed average

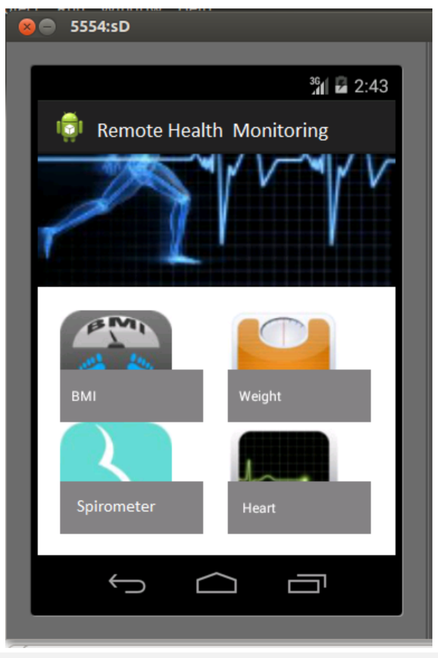
BMI Calculator

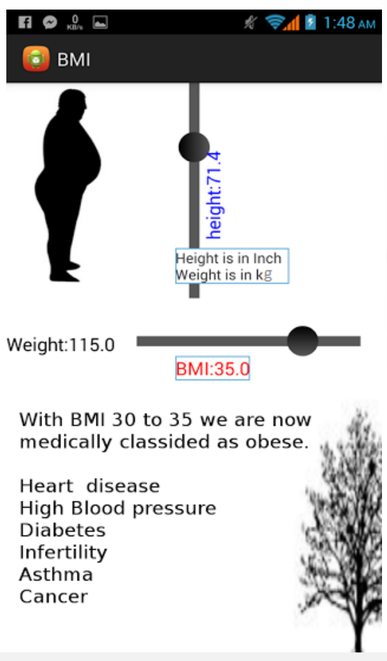
- BMI is Body Mass Index which is a proportion of height and square weight
- BMI range tells whether a person should concern about food taken and weight controlling and maintenance
- BMI range varies for children to adult person or men and women and in some special cases like pregnancy etc.



Outcome

- A complete smartphone based app is developed for all these remote health monitoring technologies
- Spirometer and skin temperature measurement requires the arduino controlled devices to collect data.
- BMI calculator need manual inputs of data for checking condition
- Patient data will be uploaded to server via smartphone app to be monitored
- BMI output predicts the symptoms which has the possibility to occur and suggests how to maintain good BMI
- Heart rate measurement will be updated with suitable info in future works





Conclusion

- Technology integration with medical sector has always great potential
- Remote patient monitoring and health checking opens a new field of research
- Mass awareness is needed for starting using these technologies
- Low cost spirometer needs sensible fan to accurately read data
- Skin temperature sensor with hygrometer sensor can measure body climate under cloth which can be used to recognize user activity and physical conditions
- BMI for special cases will be implemented in future like for pregnancy, weight tracker etc.

References

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