1. Objective and Motivation

- Obesity is a pan-European epidemic presenting a major barrier to the prevention of chronic non-communicable diseases. It is becoming an epidemic affecting the life of over a billion citizens globally [1], [2].
- In the UK, two thirds of men and 50% of women are overweight. If current trends continue, the year 2030 will witness over three quarters of the British men being overweight.
- A great challenge facing the community is to introduce population-wide approaches to weight management as existing health and medical provisions do not have capacity to cope.
- Technology nowadays is being an essential tool to provide worldwide healthcare especially for those who are not able to visit their physicians or healthcare providers more often.
- The encouragement of taking preventative measures to the upward trend in chronic diseases is getting through and more people are self-managing their health.

2. Research Outline

- When direct observation is not feasible for a case or a study of low frequent body movement a portable device is attached to the individual’s body to record and measure his/her motions [3].
- Activity monitoring systems have progressed in the past few years, specifically 1990s, from a simple pedometer to a multi-sensor accelerometer. Storage of raw digitized movement data, or average of data can be stored in selected epochs of time, usually 2, 5, 30, 60 or 120 seconds [4].
- They are usually used to measure calories burned and energy expenditure after some physical activities have been performed. Physical activity monitors are commonly small and easy-to-use by children and adults.
- This paper outlines a research project where Bluetooth technology can be used to connect a commercial wrist-worn activity monitor with a Windows Mobile device to allow the user to upload the activity data to a remote server.

3. Mobile Device Activity Design

- We outline here an embedded Bluetooth Windows mobile application developed connected and used for data upload to the web-based health monitoring system (MiLife) that is intended for round-the-clock use by a patient/user.
- This windows mobile application connects with a MiLife system wrist band - Personal Activity Monitor (PAM) – via a Bluetooth wireless connection to transfer the data to the upload device then upload it to the system’s server to be able to display one’s progression and statistical results.
- The components of the MiLife system - also called Actors- are essentially linked and connected together to deliver optimized service to the user.

4. Mobile Device Activity Monitoring Application

- The principle system elements are:
  - **Accelerometer**: A LISL3LSVLDQJ triaxial accelerometer (3-axis) from STMicroelectronics. It acquires data on a firmware running on a Microchip PIC18LF2520 microcontroller (PIC firmware).
  - **MMI**: Controlled by the PIC firmware. The Man-Machine Interface (MMI) consists of a LED and an MBF – a Light Emitting Diode and a Multi-Function Button.
  - **Power Management Circuit**: It identifies the PIC while its battery is charging and when it becomes fully charged.
  - **PC**: A Bluetooth-enabled PC that runs the MiLife application software. Which is for this purpose will be substituted with a Windows Mobile Phone Version 6.1 that will adopt the application being developed.

The application is developed in .net on Net Compact Framework 2.0. It transfers the data that has been retained in the PAM to a Bluetooth-enabled Windows Mobile and then uploads it to the MiLife server. The flow of work with the different state and events that the system goes through to reach the ultimate goal of allowing the user to explore their results online is shown in Figure 3.

- After setting a valid time in the PAM, it will directly starts to monitor acceleration measured in three orthogonal directions X,Y and Z once every 100ms. The measurements after that will be passed to the PIC to be stored in a three 12-bit long, two’s complement binary numbers form. Earth’s gravitational acceleration plays a scale factor – appointed as O.) - linking these binary values given by the accelerometer datasheet. So an absolute acceleration of 3g per g is obtained if the PAM is not subjected to any acceleration other than gravity [6].

- Figure 4 illustrates discovering the PAM’s Bluetooth. Here we can see that the “Connect” button appears to enable a connection between the PAM and the Windows Mobile device.
- We also see the application prompting for the user’s ID and Password to authorize data transfer from the PAM to the Windows Mobile application. After entering the user’s ID, the application gets connected and the ‘GetStatus’ function would display the PAM’s status and readings.

5. Conclusion

- Obesity levels in populations are on the increase throughout the world. Due to the range of health problems associated with this medical condition, significant pressure is placed on health care provision budgets.
- Remote Monitoring of patients outside of clinical environments is beginning to have an impact and much research has been conducted into the benefits associated with keeping patients in their home environments [5].
- Activity monitors are useful devices for gauging various levels of intensities of activities and are becoming more widely used in clinical trials into obesity. This research examined the use of a windows mobile application which paired with a commercial activity monitor.
- We present here a Mobile application which connects to the MiLife “juice” central server to upload the collected data from the PAM and therefore allow the users to read their status and follow their scheduled progression [6].

References


