Slide 2:

The aim of the project was to make a portable, heart rate monitor which would be able to diagnose any abnormal heartbeat patterns such as arrhythmias. This device would enable people to know immediately if they are suffering from such heart conditions without going to a doctor. The device is compact and easy to use to allow people of most ages to use it comfortably.

Components: a raspberry pi, a photoplethysmographic (ppg) sensor (main component used to gather data), Arduino micro (converts the data from the sensor from a voltage to a whole number), ideally a monitor to view the raspberry pi interface.

If this was a commercial project, then the aim would be to make the device as small as possible to allow for maximum portability like how fitness trackers etc are much smaller.

Cheap: had more than £50 of the budget left after buying all the components

Slide 3:

First, I’d like to go through some background:

An arrhythmia is defined as a breakage of the rhythm (of the heartbeat) either in timing or shape (of the ECG trace). If the shape of the ECG trace is different to a normal ECG trace, it means that the electrical activation didn’t occur in the sequence it should have. The mechanical action will also be out of sequence thus the shape of the trace will be different. This is a cardiac arrhythmia.

Now on this slide, you can see a normal ECG trace, and the components that make up that trace. The main component that I have used in my project is the R peak in the QRS complex, this is when the ventricles (the bottom two chambers of the heart) contract.

First explain diagram in the bottom left

This is showing how each wave corresponds to what is happening in the heart.

Next explain different arrhythmias

Tachycardia, bradycardia, just some form of arrhythmia

Slide 4:

In the previous slide, I had shown an ECG trace, however, I shall be using a photoplethysmographic sensor instead as ECG has to be conducted in a clinical setting and has various other technicalities with the number of leads needed and special conducting gel which reduce the usability of the product.

Photoplethysmography works through changes in the absorption of a low-intensity infrared (IR) green light. When light travels through organic tissues it is more strongly absorbed by blood than other tissues such as bone etc. The PPG sensor can distinguish variations in the flow of blood through this change in light intensity. The voltage signal from PPG is proportional to the quantity of blood flowing through the blood vessels.

I would like to introduce you to the idea of heart rate variability:

A healthy heartbeat contains healthy irregularities. Even if your heart rate is, say, 60 beats per minute, that doesn’t mean that your heart beats once every second.