Week Starting 26th September

By Tuesday, Matti had completed 3 main attributes we'd decided to include in the gait signature stage, and generated test data based on the video sequences: `P0_S1_C2_M0_G[1,2,3,5]_T1` from the VIP video archive.

We thought that this might help to give us some idea of how well the system would work. I ran the data through the Dentritic Model to achieve surprisingly good results when you consider how little data we had for training. From the video archive, Gait 1 is 'normal', and Gait's 2, 3 and 5 are different conditions. We were unable to use Gait 4 as the video sequences were out of order. The system correctly classified Gait 1 as being harmless, and switched to 'danger' mode in a very timely fashion for all other modes in various arrangements of sequences.

http://www.doc.ic.ac.uk/~sl203/cc/Report/sample.gif

The above image shows the output from the Dentritic Model using the gait data, where the X-axis represents item ID, where ID's are assigned contiguously based on input gait signatures, and the Y-axis represents 'danger'. Red is 'normal' gait, and each other colour is a unique gait type.

In order to get a better feel for the gait signature data, I used MATLAB to plot the 3 main attributes of the gait signature in 3-Dimensional space, using a different colour for each gait type.

http://www.doc.ic.ac.uk/~sl203/cc/Report/seperability.fig

Blue is normal gait, and you can see that it clusters quite distinctly from the other abnormal gait types, suggesting that the signatures are indeed useful for distinguishing abnormal from normal gait. In fact, all gait types formed visible clustering in this 3D shape space, which suggests that the same gait signatures might enable gait classification, given more data.

I decided to implement a simple Euclidean distance classification system that can classify N-attribute signatures using an N-Dimensional shape-space, and using a last-M average for stability and reinforcement over time, and dynamic normalisation. Though expensive, this would allow us to test the absolute capability of our data-set for classifying gait. I also have a nice idea as to how to reduce the complexity and memory requirement of the algorithm by using a variation of clonal selection to generalise points in the Shape space for each classification class.

On Wednesday I met Gabriel and Matti to discus a batch test on 4GB of pre-classified video data to establish the accuracy of the system. I'm currently waiting for signature generation to be completed for some of the data to run some more sample tests to establish the scope of our batch test. Some of the questions we need to answer before performing a batch test are:

1. Are gait measures specific to individuals, or can we use the same training data for each classification?
2. Does each gait abnormality form distinct clusters in Euclidean space?
3. What effect do gender, age, frames and sticks have on signatures?
4. Do different activities form clusters in Euclidean space?

Although the previous week has been my last working under UROP, I'll continue working with Gabriel and Matti to establish the effectiveness of the Detector system and the simple gait signature for machine learning purposes as it is a very interesting area, and I've very much enjoyed working on it.