CAN WE DETECT EXPERT AND NOVICE ANAESTHETISTS BY HOW THEY WATCH VIDEO?

INTRODUCTION

How would you look at the picture below?

- How do you, with no medical experience, view this:
- How would a medical expert view this?

We can record eye tracking data as experts/novices view this scene:

- We then build a model to determine how expert the viewer is.

My task was:

- to compile data for just such a task,
- build a computer model - look some traceable pattern throughout experts.

<u>WHY DO THIS?</u>

The end goal for all this, is to design a program that can track a trainee anaesthetist as they view clip after clip of scenario, and at the end score the trainee against the average expert. This would be

TOOLS

The raw data I needed was recorded as part of a previous CUROP so I my task was to process this information and mould it into a statistical model. The tools used for this were:

- Tobi camera used by the previous student to record gaze of the subject.
- Sample videos provided by the Dept. of Anaesthetics.
- MATLAB using a student license with additional toolboxes:
  - Netlab - a free toolbox provided by with multiple learning algorithms for clustering.
  - Hidden Markov Model Toolbox – A free toolbox from mathworks

PROJECT STRUCTURE

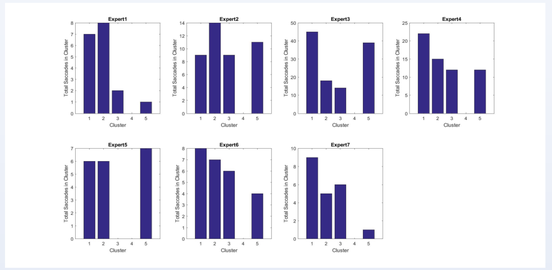
- Collect and convert data from original format.
- Visualise data – overlay gaze data over source videos.
- Extract characteristics from data:
  - Identify objects in the picture.
  - Order in which each object group is viewed.
  - Time spent outside of recognisable objects.
- Translate as many of the useful properties into a temporal domain.
- Generate one/two models (based on results of previous step).

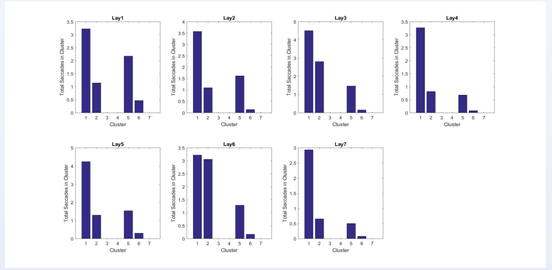
REFERENCES

- Netlab – Free Toolbox provided by Aston University
- Hidden Markov Model – Authored by Mo Chen
- Previous Eye Recording Data – from Ameen Ul-Haq's CUROP of the same title.

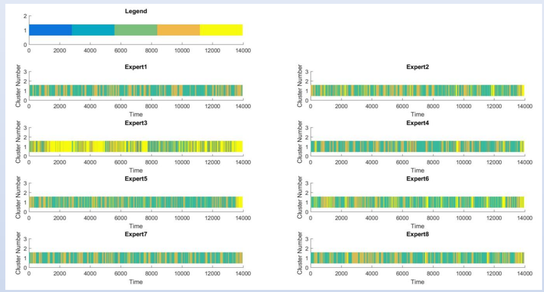
RESULTS

The gaze data was clustered using the Gaussian Mixture model The data was then validated using statistics based on the models created. I found some interesting properties shared by experts. Below is the number of times an expert vs. a layman focused on each object group:





I was also able to find some similarity between experts in the order in which they look at each object group:



There were some distinct patterns which show promise for building a general model.

FURTHER STEPS

<u>CLUSTERING</u>

Due to the use of clustering as a basis for both measured properties, it was impossible to measure either for clips with moving elements. One task moving onward would be to find a method for identifying dynamic objects within a video programmatically and tracking gaze on these objects.

<u>CLASSIFICATION</u>

Due to set backs in the project, I could not in time, run the statistics I had gathered through any classification algorithms, and instead had to complete the project before testing my hypothesis that these were classifiable attributes.

<u>IMPLEMENTATION</u>

The intended application of this project, given it's success would have been to implement it in an educational app for use in developing countries, namely Zambia

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