Feature tracking as an indication of attention

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***Abstract*—This paper presents a technique to track various features of the face using a web-cam interface. The primary application of this development is to aid in the training of non-human primates. The program will use feature detection as an indication of whether or not the animal is paying attention and provide the researcher with real time information. The user can choose from 6 different features and the graphical user interface will display the number of experimental trials when the animal was inferred to have been paying attention and not paying attention. It will also provide a visual history of the past 100 trials to provide a qualitative measure of the animal's attentiveness.**

I. Introduction

While non-human primates are often used to study neural activity *in vivo*, training the animal to perform the required behavioral task can often times be the most challenging aspect of the experiment. In a typical experimental set-up, the monkey sits in a recording room, which presents a new, unkown environment, causing the monkey to be easily distracted, difficult to train, and hard to keep focused. In particular, researchers studying the neural control of volitional movement train monkeys to perform behavioral tasks while recording the extracellular potential of neurons in the cortex.

Training Goals Total trials Success rate

Statistics Successful trials Unsuccessful trials

Identify null trials

Quantitative and qualitative

When trying to teach, the attention of the pupil is essential. In monkey labs, it can often be a difficult process to teach a monkey new tasks. The timing of the goal and the reward is important for the monkey to experience reinforcement learning. If the monkey isn't paying attention, he may do the right thing, but at the wrong time, and not realize what he is doing right. For example, in my experiment, a robot presents an object to the monkey and he must grab it. The monkey begins the trial by pressing a start pad. In order to teach the task, we give liquid reward when he touches the start pad, when he reaches for the object, and when he successfully grabs the object. Sometimes the monkey will leave his hand on the start pad, receive his reward, but not ever look at the robot. In this case he is not learning and I do not want the robot to present the object or the monkey to be rewarded. Our proposal is to use the webcam to determine whether or not the monkey's face is pointing in the direction of the robot. If so, he is 'paying attention.' After this is refined, we will try and track the eyes to see exactly where he is looking. This will interface with the robot control to abort the task if it determines the monkey is not 'paying attention' and improve the learning of the monkey.

II. Methods

Our main technique will be to use feature detection as an indication of the animal's attention. Using OpenCV, we will interface with a web cam and capture and image at 3 Hz. The feature detection code captures the image and compares it to a database of positive matches to determine if the feature is detected. If the feature is detected, it draws a red rectangle around it.

Feature detection

Positive/negative trial Green/red box Update the running tally

Percent of positive trials for attention

Log file

III. Results

The results go here.

IV. Discussion

The discussion goes here.

V. Conclusion

The conclusion goes here.

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References

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