Connecting the dots: Discovering what's important for creature motion

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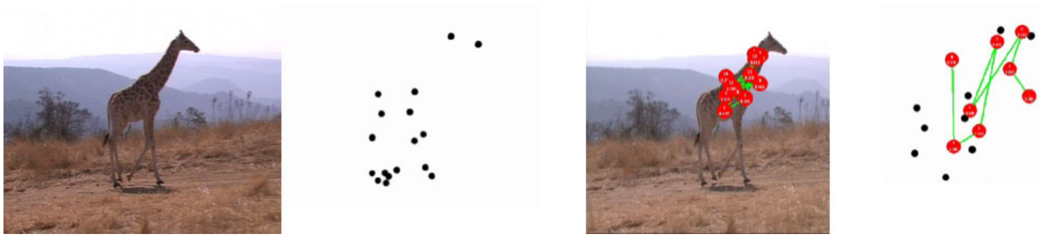

Figure 1: *A single frame (from left to right) full resolution, "dot"representation, eyetracked data over full and eyetracked data over "dot".*

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1 Introduction

We present an experiment designed to reveal some of the key features necessary for conveying creature motion. The ultimate goal is to find the minimal representation necessary to communicate recognizable locomotion or traits that may be communicated to the viewer through motion such as size and attitude. Motion and form are separable for digital characters and each contributes to viewer comprehension of action and intent. Advances in motion capture techniques have increased the amount and fidelity of data available to recreate performances digitally. However, even minimal information contained in point light displays can be sufficient for human gait perception [Johansson 1973]. Manipulating this minimal information can even affect the perceived gender of point light movement. For example, exaggerating the movement of points representing hips or shoulders can bias gender recognition [Cutting et al. 1978]. Minimal representation of animal motion could benefit animators in a number of ways. Creature animators often use animal motion *video* as visual reference. However, video does not disclose precise anatomical detail, especially when compared to motion capture data. For wild animals MoCap is generally not a viable option. Therefore, such motion must be created through manual key-framing. Even with a well-built rig, this is not efficient or intuitive for defining motion. To build a better system, we need to determine what level of detail of motion information from reference video is required for recognition and, conversely, what details can be safely ignored. To develop a new way of creating and managing animation and animation controls, a better understanding of how we perceive motion itself is necessary. This work takes a first step toward improving our understanding of animal motion and how it can be mapped to controlling creature motion.

2 Experiment

We conducted similar experiments to those of [Cutting et al. 1978] using motion video of animals in side view where kinematic motion is most apparent. Five participants were eyetracked while viewing 20 video segments. Half the video was full resolution while the other half featured a sparse point representation of an animal. The sparse representations were viewed first, then the full. Within each type presentation was randomized. Representative points were selected by hand based on knowledge of the animals anatomy. In addition to asking the subjects to identify the animal and characteristics, we used eye-tracking to determine where people looked in the hopes of learning what is important for species recognition. Eye-tracking data allows comparisons between how the viewers visually process the full resolution video and how they visually process sparse point display, a single example is shown in Figure 1.

2.1 Results

In the full resolution images, as expected, participants correctly identified the animal 100% of the time. What is interesting is that 38% of the time people could identify the animal correctly just from the sparse point representation. However, some animals proved more recognizable in sparse form than others. The giraffe for example was correctly identified from points by all but one participant, whereas all five failed to recognize the bear (not side facing) or the zebra correctly.

3 Conclusion & Future Work

Our investigation represents an initial step to answer the question of how best to minimally represent the signature motion of a creature. Results show that in certain cases a collection of points can adequately represent recognizable motion. Analysis of eye movements help reveal similarities and differences in how representations are processed. Further experiments should help us reveal the minimal information necessary.

References

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