

What is My Dog doing Now? Modeling Dog Behavior from Live Stream

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Abstract

Posture and motion detection for human have been a fairly popular academic topic recently due to its wide application in downstream tasks. However, little has been done towards our fur friends/family members. In this project, we are going to explore the videos streams from a dog camera, applying computation vision techniques and trying to better understand of their behaviors when the owner is away from home. This feature would also turn our cameras into the smart ones that could alert abnormal behavior of pets.

Motivation

Lab experiments (Lucas, Powell, and Murphree 1977; Wauquier et al. 1979; Copley 1976) have shown that a typical dog sleeps 14 hours a day but the mean of sleep-wake cycle is about 83 min. When the owner is away from home, the dogs change their behavior and are switching between alert and drowsy even more frequently.

While nowadays' dog cameras provide a live perception of our fur friends, the product is not completed with crucial component missing: the lacks of semantic interpretation makes the owner upset and very hard to respond immediately unless they put up the live stream all the time. For example, when dogs are chewing a chocolate or jumping out of the play pen, it is better to notify the owner immediately rather than recording the video in the back-end. It has been a couple of years since researcher applying deep neural net for human pose detection (Cao et al. 2017; Toshev and Szegedy 2014), but not until recently dog or animal focused projects (Ehsani et al. 2018) has incorporated and leveraged the prior knowledge for them. In this project, we try to close the gap by modeling dog postures as well as motions using image processing technologies.

Dataset

We are going to create a dataset by ourselves. We have one 11 month Shiba Dog, Keke, for this experiment. Keke stays in its play pen most time of the day and the entire area is covered by a YI Dome Camera 1080p HD camera¹ 24/7 with an FPS of 15. Sample images as the following²:

¹For detailed specification, please see the appendix.

²We might change the angle and setup to accommodate different use case later.



Figure 1: Sample image from the current camera setting; Keke is sleeping

Task definition and scope

Goals

This project will focus on the detection and analysis of the dog postures and motions based on dog camera video streams. More advanced features including alerting the owner when abnormal behaviour of the dog is observed will be included depending on the project progress.

Milestones

1. **Collect images:** Image will be sampled from the frames of 7 days ($9072000 = 7 \times 24 \times 3600 \times 15$). Image processing techniques will be used in sampling to get more representative data.
2. **Label data:** Images need to be annotated with dog postures, as well as status, e.g. sleeping, standing and eating.
3. **Detection:** We will start the experiment with fixed camera angle/position. After detecting the dog position in the image, the part of image with dog will be extracted for further analysis.
4. **Classification:** Based on the detection result, we will try to classify the status of the dog. Analytical result will be summarized
5. **Generalization:** We will carry out similar experience with a different setting of cameras, background and maybe dog if we have enough time.
6. **Deployment:** We would like to engineer the speed and reliability of the algorithm and deploy it on **PC** for live demo.

References

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Appendix

Specification of cameras

- Viewing Angle: 112 wide-angle/Total 360 full panoramic viewing angle
- Image/ Audio Enhancing: 3D Noise Reduction, 4X digital zoom, LDC
- Image Sensor: 1/2.7" 2MP CMOS sensor
- Video Streams: 1080p/15 fps
- Infrared Night Vision: 8*940nm IR LEDs

Bio of Keke



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Hi, my name is Keke (科科 in Chinese, Kaká in French, ケケ in Japanese, Keke in Indonesian/Unicode, etc.) -- I do support universal word embedding now.

I am a bug-free and active/online/several shots, general purpose intelligent system that moves around using 4 3-DOF(degree of freedom) brown/white legs (Aka. Shiba Inu Dog). I am originally from Arkansas and Hao flight with me for 5 hours to get back to my new home at Stanford. I am here to help Hao with his Ph.D. research in AI and Applied Research at Landing AI. I am very hands-on (or actually legs-on) and sometimes pull Hao too much to my direction. That been barked, Hao did an excellent job in the curriculum design -- we will see how the training goes.

Fun fact: I use a data structure of circle-dance as the counter for floors in the elevator, see the following:

👍 18 🐾 10 ❤️ 11

Wire-frame of dashboard

