Dual purkinje eyetracking with cats

Author(s): Körding, Konrad; Betsch, Belinda; Benucci, Andrea; Kayser, Christoph; König, Peter

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**Introduction**

The standard method for eye tracking on cats is the skleral search coil method. Its advantage is its potentially easy calibration and the common use in several common laboratory animals (e.g. cats, monkeys). The disadvantage is the fact that surgery is necessary, that external changing fields are necessary potentially influencing microelectrode recordings and especially the non-linearity inherent in the methods. To address these problems we established dual purkinje eye-tracking on cats. That method, which has been shown to be extremely linear when used on humans, is transferred to cats. Here we explore its potential use, the problems that occur when using this technique on cats and how these can be resolved.

**Fixate cat’s head**

The cat’s head is fixed with a fast fixing mechanism.

**Experimental Setup**

The cat’s restrained head is directly in front of a dual purkinje eyetracker.

**The eye-tracker**

The eyetracker is a very complicated analog device for tracking the first and the fourth purkinje image (see below).

**Complete Setup**

![Diagram of the complete setup](image)

- **Eyetracker**
- **Diode**
- **Cortical signals**
- **Signal made weaker**
- **Preamplifier**
- **Headstage**
- **Amplifier**
- **Computer**

When light shines into an eye it is not only reflected once at the surface of the eye but another time from the backside of the cornea, from the front and from the backside of the lens from the front it looks like this. The relative position of first and fourth purkinje image is proportional to the direction of gaze.

This is the picture from the front while the cat is looking around. Clearly visible is that the fourth position changes as the cat is looking around.

**Typical traces obtained with that method while the cat is watching natural videos.**

**Main Result**

Cats do on average 4.95 saccades per second for the 10 minute interval analyzed, as a comparison: humans typically saccade three times per second.

**Conclusion**

- **Disadvantages**
  - Big, heavy
  - Difficult to handle
- **Advantages**
  - Convenient
  - Precise
  - No surgery

**References**


For training mild food deprivation is used; food is a reward of cooperative behavior. All preparations were done according to NIH and SFN regulations. None of the experiments means unnecessary harm or stress to the cats, no visible signs of stress of the cats can be observed.