

Supporting Information

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SI Materials and Methods

The OwlCam is a lightweight microcamera combined with a video broadcasting board, cast into a customized frame of dental cement (Fig. S1 A–F). Its small size and rigid physical properties allow its use in small animals (e.g., rats, mice, birds) to provide a genuine first-person view of the animal's visual field. The individual parts, detailed below, are all off-the-shelf. The total cost of one OwlCam unit is ~150 Euro.

The camera unit consists of a 1/4-inch complementary metal-oxide semiconductor active pixel sensor (purchased from <http://www.microcameras.com>) equipped with an objective lens and adjustable focus. The vertical resolution is ~380 lines, and the horizontal field of view is ~60°. The camera's outer dimensions are 8 × 8 × 10 mm, and the weight without cables is 1 g. Power intake is specified at 7–12 V DC, 30 mA, but the camera operates at a lower voltage. The camera comes with a cable connector with built-in step-down converter to accommodate typical power supplies, such as a 9V battery. We have good experience with the considerably lower 3.7 V delivered by a single lithium polymer cell if the converter is discarded. If low overall weight is a goal, all cable pieces can be unsoldered from the camera. The cable consists of three individual strands sheathed in a rubber coating. Although the coating can be discarded, the strands should be kept for later use, because the enameled copper wire type is light and relatively easy to solder (Fig. S1A).

The camera unit was wired to a 900-MHz video broadcasting board (transmitter), which can be easily obtained by dismantling a low-cost “spy camera” available at many online stores. Typically, these cameras also come with a receiver unit (Fig. S1E). If more than one camera is used with a single receiver, care must be taken to ensure that the receiver is either tunable or has shiftable discrete frequency settings. Usually, the broadcasting unit can transmit an audio signal as well if necessary. Video and power connections are made by soldering copper strands to the camera and transmitter board at a short distance. Solder con-

tacts and the back surface of the camera and the transmitter are then covered with a fluid rubber coating (PlastiDip) to prevent current leakage and to improve durability. Power connectors can be custom made from spare cascaded IC pins (Fig. S1 A and D). The antenna of the broadcast unit is cut to an arbitrary length, because the transmission range is relatively small and antenna length is not critical.

The entire setup is cast into dental cement (Paladur, Heraeus) to fix the physical layout of the camera and also provide the custom-made mounting socket. The mounting socket slides onto a small metal plate implanted into the owl's forehead. The camera's field of view must be prealigned before casting. The dental cement and rubber coating increase the unit's overall rigidity and durability, making the OwlCam easy to handle, especially in difficult situations while equipping the animal (Fig. S1B). The weight of the setup without batteries is 3 g. A lithium-polymer rechargeable battery (LiPo; Tenenergy) is used to power the OwlCam at 3.7 V. The battery is mounted to the OwlCam by taping it to the long side of the camera (Fig. S1C). The choice of battery capacity governs the total weight of the setup, with a 70-mAh cell weighing ~2.5 g and a 25-mAh cell weighing ~0.9 g (Fig. S1D). The lifetime of a fully charged 70-mAh LiPo battery is ~145 min of constant recording, and that of the 25-mAh battery is ~45 min.

One of our goals in this study was to miniaturize the original camera setup developed in an earlier work (1), as shown in Fig. S1F. The total weight of the original setup was 29 g, and some animals displayed a noticeable change in behavior (in particular, head shaking and forward inclination of the head) while wearing the device. No behavioral changes were observed with the new setup, and the same video quality and transmission range were obtained at a fraction of the original total weight. The latest prototype involves a custom-designed transmitter board and reduces weight by another 1 g. With the 25-mAh LiPo battery, this setup has a total weight of <3 g, all other things being equal (Fig. S1C).

1. Ohayon S, Harmening WM, Wagner H, Rivlin E (2008) Through a barn owl's eyes: Interactions between scene content and visual attention. *Biol Cybern* 98:115–132.

