Building Implicit Interfaces for Wearable Computers with Physiological Inputs: Zero Shutter Camera and Phylter

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Abstract

We propose implicit interfaces that use passive physiological input as additional communication channels between wearable devices and wearers.

Key Contribution

We consolidate a core framework aiming to accommodate implicit input for building implicit interfaces. The core framework adhere to the three key principles:
1. **Subscription**: Ability to continuously receive information since implicit physiological input is a stream of information. (Client-Server architecture over a Bluetooth, IP-based or even wired connection would be applicable to achieve this.)
2. **Accumulation**: Ability to hold the received information for a certain duration in order to allow pattern recognition over recent past data.
3. **Interpretation**: Ability to recognize the wearer's present physiological state based on the accumulated information when the wearable computer asks. (Since there may be more than one implicit channel, this ability is also responsible to encompass all implicit input channels.)

Core Framework Implementation

- **1. Subscription**
  - A notification sender, the device to send notifications.
  - A notification receiver, the device to receive notifications.

- **2. Accumulation**
  - Receives physiological input.
  - Queues the received data in a buffer.

- **3. Interpretation**
  - Processes the accumulated data.
  - Determines the present state of the wearer.

Zero Shutter Camera

Zero Shutter Camera is a native Google Glass application that takes as input a prediction of the wearer’s brain state and triggers a camera snapshot at special moments. Zero Shutter Camera determines when to take pictures by continuously monitoring the wearer's physiological state over a Bluetooth connection.

Phylter

Phylter is an intermediate software which manages notifications. It takes as input a notification and decides whether to deliver it to the target recipient.

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Reference


How Zero Shutter Camera works:
1. Subscribes continuous state classification data.
2. Accumulates data over 10 sec.
3. Interprets the quantified confidence value to determine if the user is in a high or low workload state.
4. Takes a picture if the wearer is in high workload state with a confidence above a heuristic threshold.

How Phylter works:
1. Receives notifications.
2. Decides whether to deliver the notification to the user.

Zero Shutter Camera is made open source located at https://github.com/zshiba/zero-shutter-camera