Chin Interfaces for Peripheral Interaction

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ABSTRACT

The chin interface is a wearable device that allows for peripheral interaction during everyday activities. Simple sensors and software use steady and unsteady movement data generated from everyday activities like eating, exercising, practicing guitar, or using the computer to interact with peripheral screens directed through the chin. One, two, and three button iterations of the chin interface require different levels of attention for distinct peripheral interaction experiences. Different experiences with peripheral screens can include playing back text one word at a time, slowly coloring in the letters of large words, or patiently typing out statements by selecting keys on an onscreen keyboard.

CCS CONCEPTS

• **Human-centered computing**; • **Interaction design**; • **Interaction design theory, concepts and paradigms**;

KEYWORDS

peripheral interaction, priming, slow technology, quantified self, affective computing

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1 WEARABLE CHIN INTERFACES

The first iteration of the chin interface was developed for an art series called "Chin Music" [Ables, 2018]. The "Chin Music" series used a one button mouse zip-tied to a neck posture corrector to play back midi scores of music related to what I was eating as I was eating. The mouse button was aligned under the chin to capture each up and down movement of my jaw while chewing. For example, I played back the main theme from the 1960 film "The Magnificent Seven" while eating a piece of beef jerky to feel more like a cowboy. I redesigned and iterated the chin interface to incorporate into my peripheral interaction practice using the 3D modeling program Tinkercad. I used microswitches connected to the Switch 2.0 Accessibility Switch from Ablenet and a Roland TM-1 Drum Trigger Module to turn chin interactions into signals my laptops could recognize. Additional programming was done using Max and Bome Midi Translator Pro. I used an elastic drawstring neck strap for easy adjustment and removal of the chin interface.

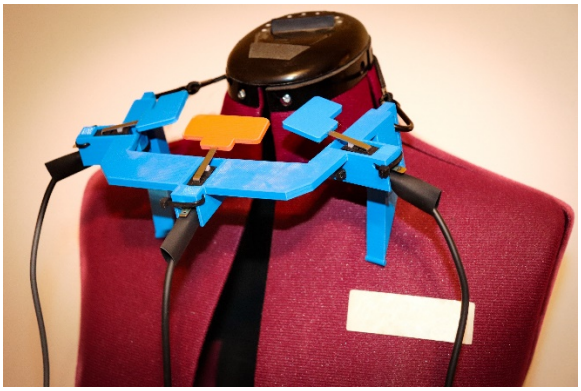

Figure 1: The three-button chin interface is used for controlling key selection from an onscreen keyboard while the movements of a user engaged in an everyday activity power choreographed cursor movements from left to right across the keys of an onscreen keyboard one row at a time.

The redesign of the chin interface has one, two, and three button iterations for interacting with peripheral content. Each additional button on the interface increases the level of focus required to interact peripherally. The one button iteration is used for chewing and playing back peripheral text that is thematically related to the food being eaten one word at a time in Rapid Serial Visual Presentation (RSVP) style. The one button iteration requires no extra attention devoted to the peripheral screen. For example, if a user eats carrots, then text content about the health benefits of eating carrots plays back on a peripheral screen with each chew. I previously investigated RSVP using hypnotic scripts through peripheral interaction during everyday activities as part of my MFA thesis [Ables, 2020]. The two-button iteration of the chin interface is used for controlling a sustained mouse click and click release actions. This iteration is used for peripherally coloring in images or the letters of words that are metaphorically related to the activity and requires occasional glances at the peripheral screen. For example, by playing guitar into a sensor, a user can slowly color in large bubble letters of the word "CREATE" to help prime their subconscious to churn out Lennon-McCartney caliber songs. The three-button iteration of the chin interface (see Figure 1) is used for controlling key selection from an onscreen keyboard. The center button selects a key while the left and right buttons are space and backspace respectively. This iteration requires the most attention on peripheral screens to patiently type out an intention, goal statement, or affirmation while engaging in a related primary activity to enhance mindfulness and reflection.

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2 PERIPHERAL INTERACTION OPPORTUNITIES

Dourish wrote of a trend in computing that "allows computation to be made ever more widely accessible to people without requiring extensive training, and to be more easily integrated into our daily lives by reducing the complexity of those interactions" [Dourish, 2001]. We have more control over our interactions with computers than previous generations without having to be skilled in coding or system functionalities. Along with the ease of interaction, computers have also become more widely available. A 2018 US Census report found that 92 percent of American households have a computer which could consist of a desktop, laptop, tablet, smartphone, or single board computer [Martin, 2021]. A study by the Pew Research Center found that in 2015, 66 percent of Americans owned at least two of the following digital devices: smartphone, desktop, or laptop [Anderson, 2015]. The same study found that 36 percent of Americans owned all three digital devices. This means more than two thirds of Americans have extra digital devices with screens in the home that could be used to display information peripherally.

Bakker writes that peripheral interaction is "interaction with everyday interactive systems that reside in our periphery of attention but can easily shift to the center of attention when relevant for or desired by the user" [Bakker, 2016]. Peripheral interaction systems can be set up by placing a laptop off to the side while eating, exercising, or watching TV. Peripheral interaction creates opportunities for phenomenological renewal of activities that have lost their original luster through repetition. Inexpensive sensors and free programs are available for users to develop their own peripheral practices.

3 POWERING OUR PERIPHERY

Movement during everyday activities can generate information to power peripheral interactions. Sensors and software can convert a user's movements into steady or unsteady text playback, cursor movement for peripheral coloring, or cursor movement across an onscreen keyboard for text input. An example of a steady action is chewing with the one-button chin interface. The user quickly learns how much jaw movement is required per chew and can adapt their chewing to interact with peripheral screens predictably. Other examples of steady activities are using an exercise bike with magnetic reed sensors or playing an electric guitar through a stutter pedal, creating a predictable signal stream for precise interaction. Steady signal generating activities are ideal for peripheral text input on an onscreen keyboard using the three-button chin interface as the user can look away and anticipate when to gaze back at the peripheral screen when the cursor is near the desired key. Examples of unsteady signal generating activities are computer mouse and keyboard use. Unpredictable bursts of signals are ideal for the two-button chin interface and peripheral coloring experiences as precision is less important.

4 FUTURE WORK

Each iteration of the chin interface creates the opportunity for new forms of interaction with content throughout the day. Just as slow technology design suggests a doorbell playing a few notes of a melody with each ring requiring several months of visitors to complete the song, chin interfaces incorporated into peripheral interaction can aid in novel extended interactions with content [Hallnäs and Redström, 2001]. Instead of typing out a note to yourself mindlessly in 30 seconds, imagine typing the same note peripherally using chin interfaces over a period of 10 or more minutes. Or for more detailed notes, picture extending this process throughout peripheral activities over an entire day, adding to the same note during different activities. How would the embodied extended interaction change our experience of the process of writing, how we remember writing it, or the choices of words we write? Would the idea sit at different levels of consciousness throughout the day as we engage in slowly documenting the idea, just like how an earworm runs through our head as a manifestation of the Zeigarnik Effect [Masicampo and Baumeister, 2011]?

There is also the opportunity to metaphorically connect everyday activities producing steady and unsteady movement data to peripheral content to enhance the experience. Imagine each time a user eats a meal they pair their chewing and the one button chin interface with RSVP text on a peripheral screen of the pros and cons of a recent problem they have been considering, literally creating an opportunity for chewing it over at each meal. Crafting content specifically for sporadic peripheral interactions throughout the day may lead to new forms of constrained writing techniques connected to the quantified self that would make the Oulipo proud [Bellos, 2010]. Future work using spare screens to prime and program our periphery ubiquitously during everyday activities may require leading with one's chin, so what better way to begin than with chin interfaces.

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