Affective Antenna for Screen Quality

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HCC 746: Affective HCI

Motivation

We find ourselves **not** being able to **relax** while **engaging** in relaxing **activities** like watching **TV** or using the **computer** in the evenings. **Connecting** our **heart rates** (HR) to the **quality** of the picture on the **screen** may help **encourage** a more **relaxing experience** and increase **interoceptive awareness**.

Background Information

- **Interoceptive Awareness** is noticing what one is feeling by tuning into the internal sensations of the body.
- **Peripheral interaction** is engaging with interactive systems in the periphery of our attention that are embedded into our routines and environment.

Research Question

How can heart rate represented as screen quality (brightness) in our everyday lives promote the development/practice of interoceptive awareness through peripheral interaction?

Methods

- Comparative autoethnography focused on different levels of interoceptive awareness.
- Used the Affective Antenna for 20 minutes when using a computer for a traditional reading, listening to a reading, or watching media task.
- Used deep breathing techniques to achieve a target (lower) heart rate.
- Tracked how many beats per heart rate zone.
- Answered 7 pre-test and 8 post-test questions detailing our experiences for each test.
- Compared our responses and experiences and created an inductive code to generate themes.
- Used SPSS to analyze heart rate zone data.

Lowering heart rate using breathing exercises **increased the brightness** of the laptop screen while reading or listening to a reading.

Lowering heart rate using breathing exercises **decreased the brightness** of the laptop screen while watching media in the evenings.

Heart Rate Zones	Milliseconds Between Heart Beats	Brightness Level of Screen (increase)	Brightness Level of Screen (decrease)
101-120	500-599	10%	100%
86-100	600-699	30%	90%
76-85	700-789	50%	70%
67-75	800-909	70%	50%
60-66	910-1,000	90%	30%
45-59	1,001-1,333	100%	10%
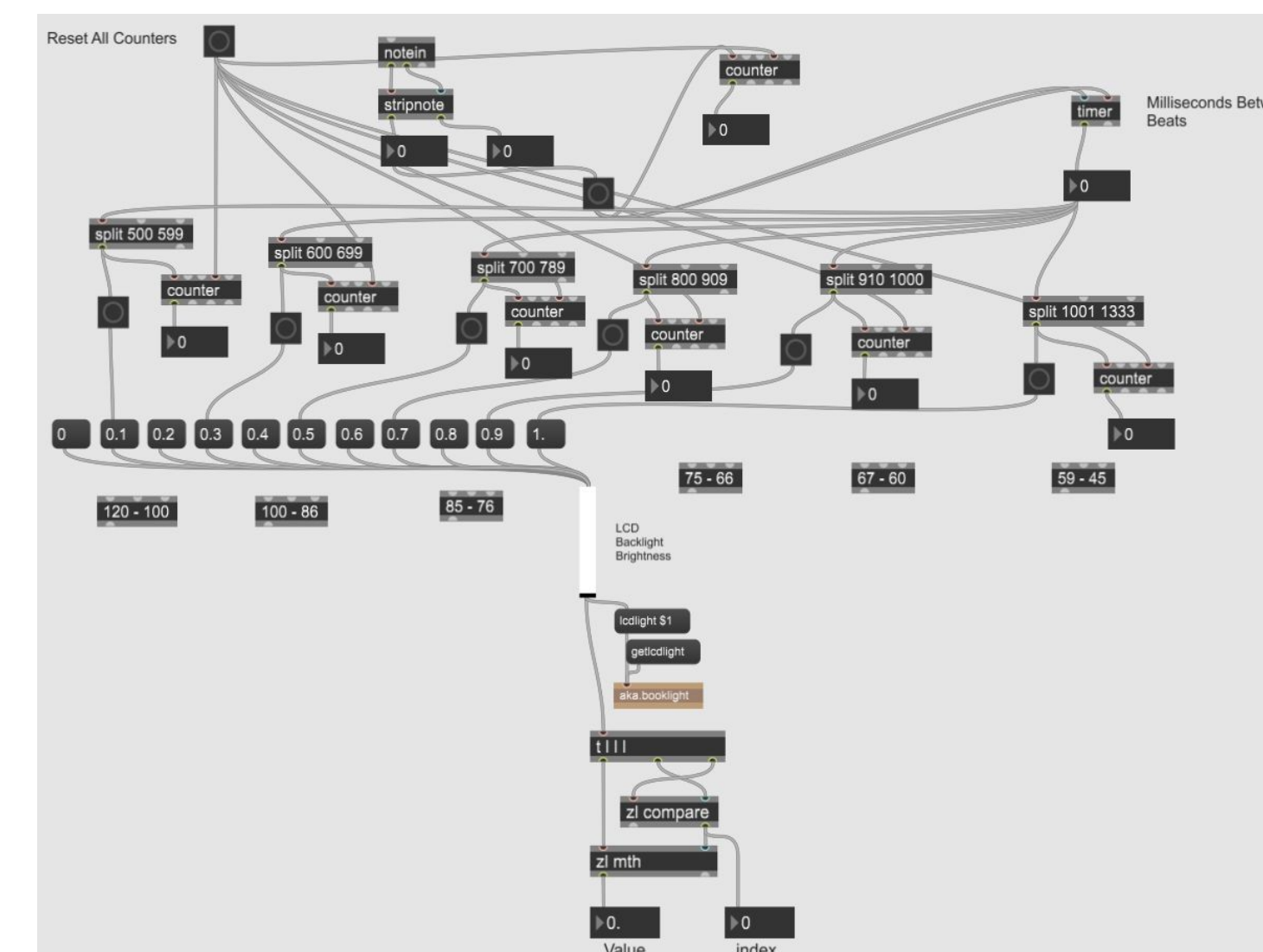
Visual programming for the Affective Antenna done in Max using the aka.booklight object.
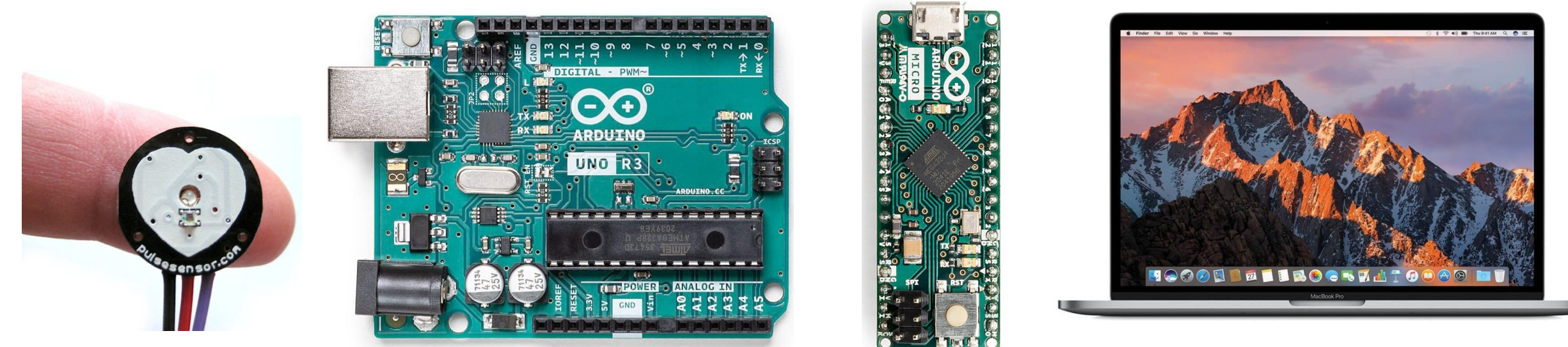
Pulse sensor is data fed through an Arduino Uno to a separate computer so the sensor threshold can be adjusted live. Arduino Uno outputs a ping for each heartbeat and sends it to an Arduino Micro into Max (see above) on the primary computer where milliseconds between heartbeats are calculated and sorted into 6 heart rate zones which causes the screen to brighten or dim. Deep breathing techniques are used to try to reach target heart rate zones and the desired level of screen brightness for the task.

References

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Preliminary Findings

- **Heart Rate Awareness**
  - "The variability in brightness helped me be aware of the changes in my heart rate, something I usually do not feel any changes." *journal entry, novice, test #5, watching*
- **Heart Rate Control**
  - "I had periods of success but was difficult to attain full control over." *journal entry, experienced, test #1, watching*
- **Concentration**
  - "If I do breathing exercises, my focus shifts too much to the breathing, and cannot concentrate on the task at hand." *journal entry, novice test #6, listening to reading*
- **Multitasking**
  - "This time I was struck by how this process is stopping my drive to multitask. It is making me focus on just the video and my breath" *journal entry, experienced, test #4, watch*
- **Stress Level**
  - "In this way it might be very beneficial to use when you are trying to focus attention on one task because it limits peripheral distractions and unnecessary movements and does seem to calm me." *journal entry, experienced test # 6, listening*

Future Work

- Having more test conditions including, writing, different locations, and standard breath exercises.
- Tracking how long a user stays in a certain heart rate zone in order to encourage more consistency in zones.
- Trying to incorporate heart rate levels into interactions like reaching a certain HR level to access the ability to highlight text in a research article.
- Expand to interaction with other devices for developing ubiquitous biofeedback environments.

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