Stress Reduction using Virtual Reality and Multisensory Interactions

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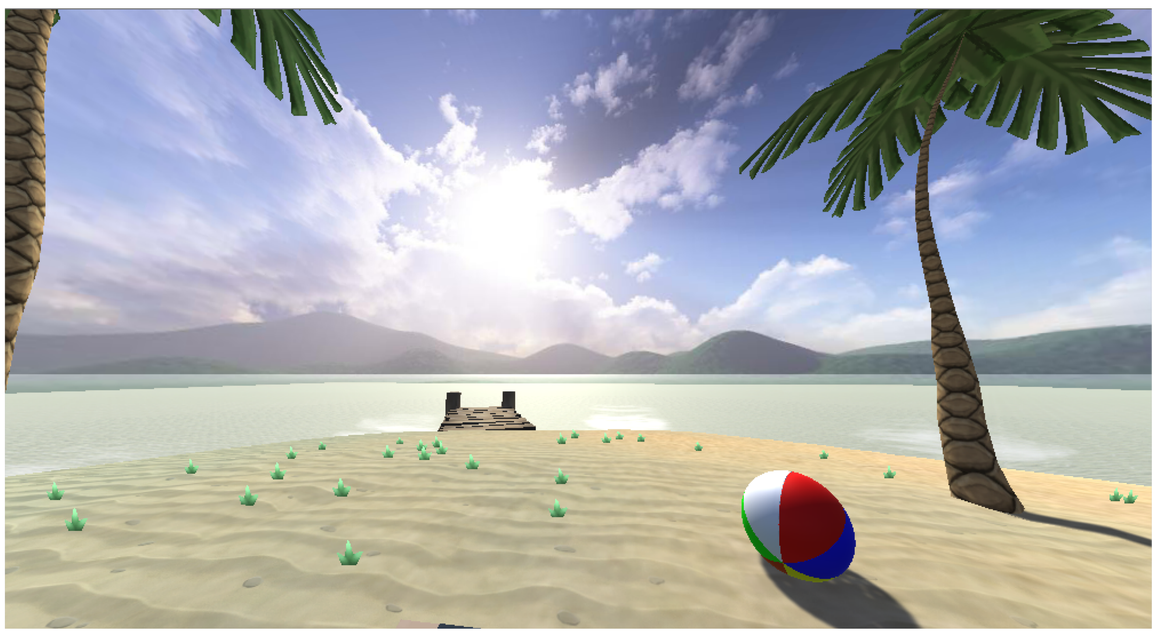
Motivation

- Stress has been identified as a risk factor in the heart diseases, diabetes, asthma, upper respiratory infections, anxiety and depression.
- Virtual Reality Therapy is effective, but can the use of other senses other than sight improve this intervention technique?

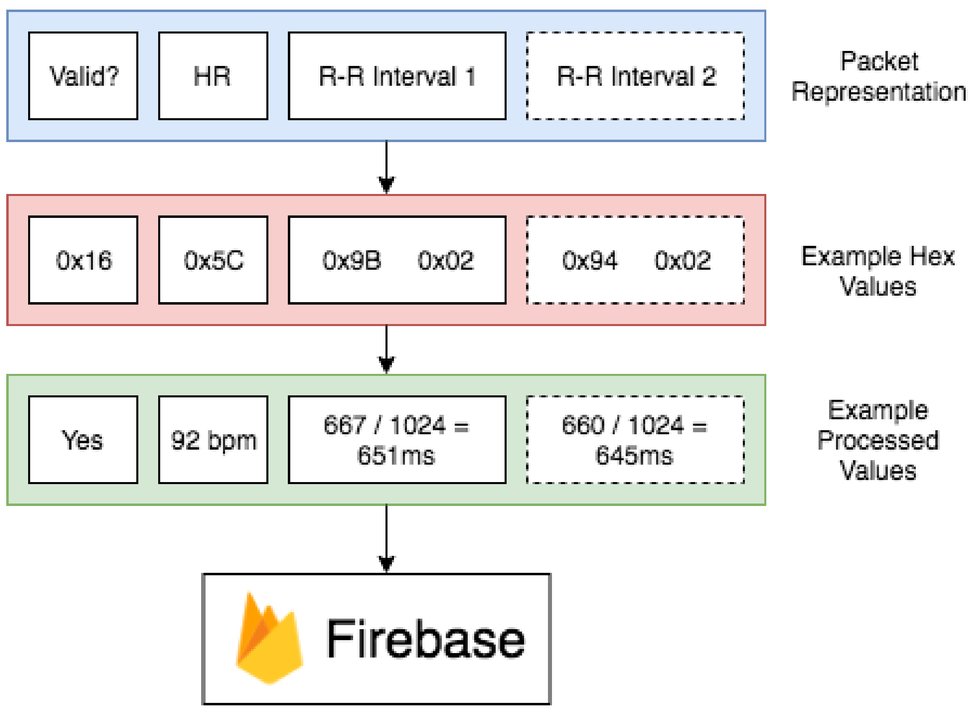
VR Environment and Sensory Interactions



- **Sight**: Virtual beach environment.
- **Hearing**: Relaxing 3D audio of waves.
- **Touch**: A bucket of sand can be felt.
- **Smell**: The scent of the sea.

Polar H7 Chest Strap (Heart Rate Monitor)

- Bluetooth Low Energy (Smart).
- Heart Rate Profile which exposes the GATT Heart Rate Service (0x180D).
- Heart Rate Measurement characteristic is of main interest (0x2A37).
- Accurately measures R-R intervals using heart's electrical signals.
- Python Bluetooth Low Energy Wrapper for OS X used.
- Data recorded approximately every 1 second and saved to Firebase.



Aims

- Explore the effect of Virtual Reality (VR) as a destressor.
- Evaluate how effective an intervention adopting VR and multisensory interactions (for example, touch and smell) is at reducing stress.
- Analyse the inclusion of different sensory interactions individually.
- Undertake user experiments for data collection.
- Find and use appropriate stress measures for evaluation of experiments.

Experiment Method

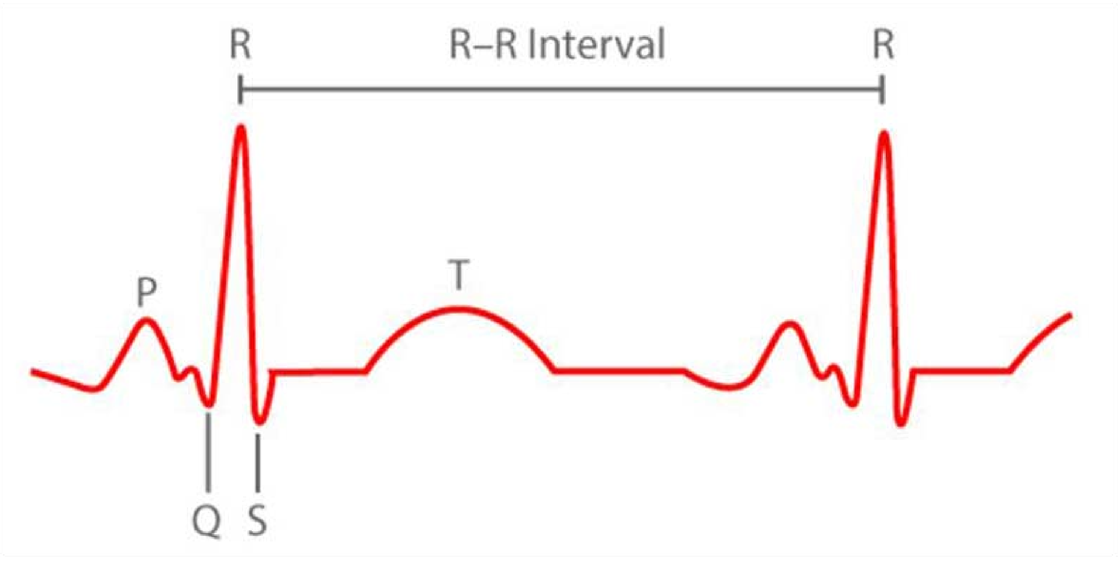
Each experiment will be 20 minutes long. This will be formed of 5 minutes for baseline readings, 10 minutes for the chosen intervention, and then 5 minutes after to evaluate whether effects are short-term.

Interventions

- Listening to a relaxing music track.
- Viewing a VR environment and listening to environment related audio.
- Viewing a VR environment, listening to environment related audio and touching an object in reality.
- Viewing a VR environment, listening to environment related audio, and smelling a scent in reality.
- Viewing a VR environment, plus listening to environment related audio, touching an object and smelling a scent in reality.

Stress Measurement and Evaluation

Heart Rate Variability (HRV)



- HRV is the beat-to-beat variation in the R-R interval.
- It is non-invasive and used to investigate the functioning of the autonomic nervous system (ANS).
- The ANS regulates the body's major physiological activities such as the heart's electrical activity.
- The ANS has 2 branches: sympathetic (SNS) and parasympathetic. The former is activated under stressful conditions, whereas the latter relaxes and stabilizes the body.
- HRV analysis is split into time-domain and spectral-domain analysis.

Questionnaires

- The State-Trait Anxiety Inventory (STAI)
- Positive and Negative Affect Schedule (PANAS)