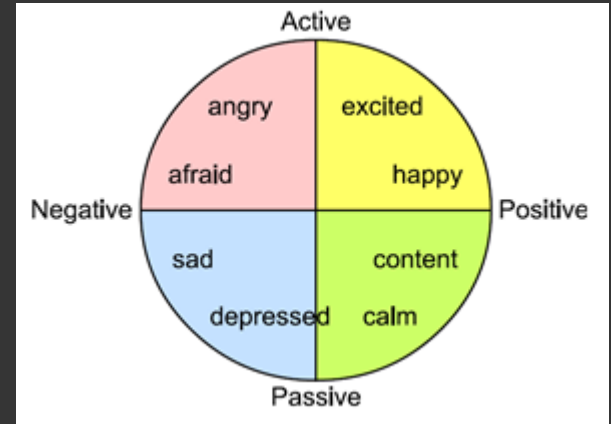# EDB4012-
FYP Proposal Defense

Title: Development of Apps to Improve Mood States

Name: Tong Yun Xian (20094)
Supervisor: AP. Dr. Tang Tong Boon

Background of Study

What is Mood States ?

- Emotion
- Valence / Arousal

Statistic of Negative Mood States

- 1 Million of US Employees missed work due to stress (America Institute of Stress) [1]

- Mood Disorder causes 50 Billion USD /year in lost productivity and results in 321.2 M lost workdays (Kessler) [2]

Why do We have to Improve Mood States?

Increase Productivity [3]

Improve Job Performance, Decision Making, Teamwork, Leadership [4] [5]

Organisation will be More successful in a competitive market. [6]

Reduce Stress Related Disease [7]

Problem Statements

- **Lack of Mood States Monitoring**

- **How to determine Mood States**

- **How to Improve Mood States**

Objectives

- To develop mood state monitoring using portable fNIRS
- To design and develop task-based game application to improve mood state

Scope of Study

- **Measurement of Mood States based on survey**
- **Brain Activities on different mood states**
- **Task use to stimulate brain**
- **Measurement of Brain Activities**
- **Methods to Improve Mood States**

Critical analysis

- **Mood States Assessment**
- **Brain Activities on different mood states**
- **fNIRS and other neuroimaging modalities**
- **Mood States Induction**

Measurement of Mood States based on Survey

- Self- Assessment Manikin (SAM) [8]

- Positive Affect Negative Affect Schedule (PANAS)[9]

- Profile of Mood States(POMS)[10]

Mood States Assessment

Approach

Positive Affect Negative Affect Schedule (PANAS)

Advantages

-10 negative affect

-10 positive affect

-Ease of usage to determine mood states

Disadvantages

Need to spend more time to complete the assessment compare to SAM

Task Use to Stimulate Brain

- Simple Arithmetic Task to stimulate brain [11]

- Measure brain using task-based activities

- Brain will be active when given a task

Brain Activities on Different Mood States

- Relation between asymmetry of prefrontal cortex activities during each mood states
- Compare the differences between fNIRS ,EEG, fMRI

Brain Activities on Different Mood States

Approach

fNIRS, EEG, fMRI

Paper Found

Major Depressive Disorder(fMRI) 13

Music Listening(EEG) 14

Urban Picture(fNIRS) 15

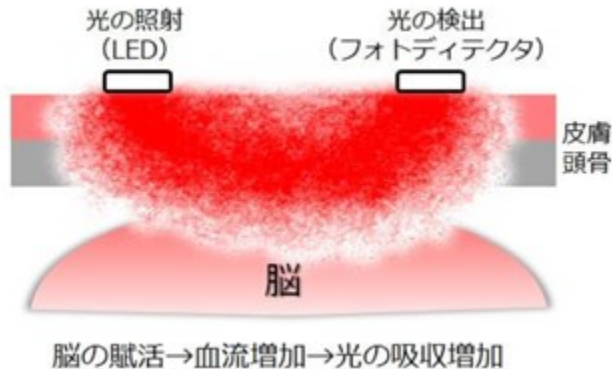## Common Traits

Valence Specific Hypothesis 12

Right PFC- Negative Mood

Left PFC- Positive Mood

Measurement of Brain Activities

- fNIRS, fMRI, EEG
- Portable fNIRS

光の照射
（LED）

光の検出
（フォトディテクタ）

皮膚
頭骨

脳

脳の賦活→血流増加→光の吸収増加

fNIRS and Other Modalities

Approach

fNIRS

Advantages

Portable, Low Costs.

Good Signal-Noise Ratio

Non-Invasiveness

Less movement constraint

Disadvantages

Low spatial resolution than fMRI and PET [16]

Low temporal resolution than EEG [17]

Methods to Improve Mood States

- Self-Statements or Velten Procedure [18]

- Music [19]

- Autobiographical Recall [20]

- Films [21]

- Photos (International Affective Picture Systems) [22]

- Use Virtual Reality with combination of Music and Photos to Improve Mood States [23]

Mood States Induction

Approach

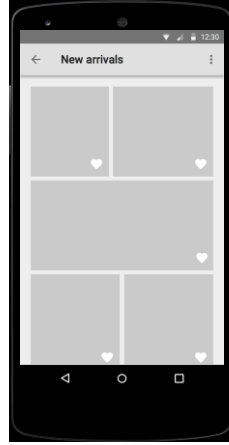Virtual Reality with Music and Video [23]

Advantages

Immersive Experience

Wider range of mood induction

Disadvantages

May cause motion sickness

Methodology

Hardware

-Portable fNIRS

-Android Phone with Gyroscope compatibility
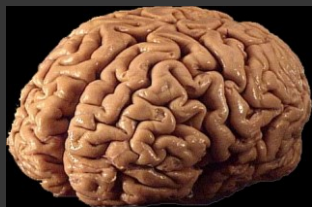
-VR Headset

-Noise cancelling earphone

Software

-Android Studio

-Unity

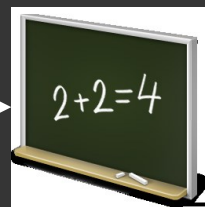-Sound Forge

System Overview

Dorsolateral Prefrontal Cortex → Portable fNIRS → PANAS Questionnaire → Arithmetic Task → Processing Asymmetry activity in brain
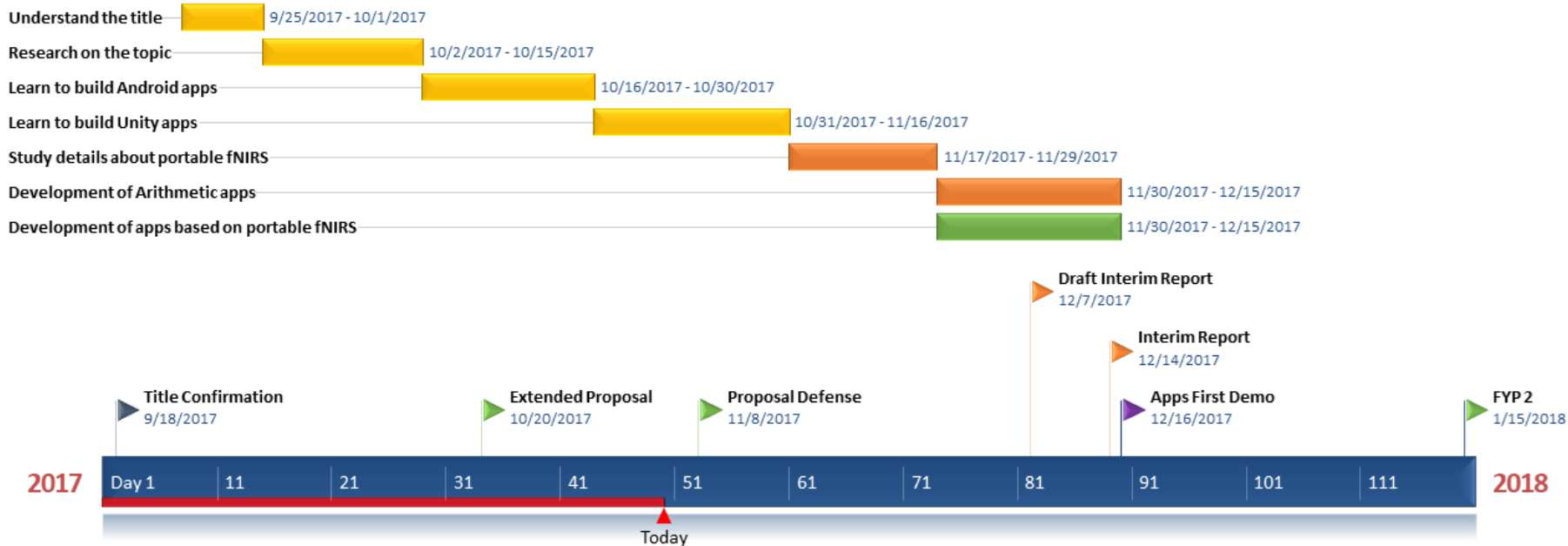
PANAS Questionnaire ← Processing Asymmetry activity in brain ← Forest Virtual Reality

Key Project Milestone and Gantt Chart

Task	Dates
Understand the title	9/25/2017 - 10/1/2017
Research on the topic	10/2/2017 - 10/15/2017
Learn to build Android apps	10/16/2017 - 10/30/2017
Learn to build Unity apps	10/31/2017 - 11/16/2017
Study details about portable fNIRS	11/17/2017 - 11/29/2017
Development of Arithmetic apps	11/30/2017 - 12/15/2017
Development of apps based on portable fNIRS	11/30/2017 - 12/15/2017

Draft Interim Report
12/7/2017

Interim Report
12/14/2017

Title Confirmation
9/18/2017

Extended Proposal
10/20/2017

Proposal Defense
11/8/2017

Apps First Demo
12/16/2017

FYP 2
1/15/2018

2017   Day 1   11   21   31   41   51   61   71   81   91   101   111   2018

Today

Conclusion

Accomplished Work:

- Create Task-based application based on simple arithmetic to stimulate brain

- Acquire all the software and necessary library files

Future Work:

- Design and Create the virtual reality forest with nature sounds using Unity

- Tested the functionalities of portable fNIRS

- Link smartphone with portable fNIRS

- Obtain raw data from fNIRS to smartphone

- Analysis of data and troubleshooting

Expected Results:

- Mood state monitoring application

- Application to improve mood state

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Current Progress

Arithmetic Task