Tundra Game for Kids

Digital Engineering Project (12 CP)

Jun. Prof. Christian Hansen

WSoe 16/17

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Mat # 210492

OFFICIAL TITLE

"A Projection & SensFloor based Augmented Reality educational game for Museums"

AGENDA

1. Motivation
   a. Topic
   b. DE Project
2. Introduction
   a. Survey of Museum
   b. Software Requirement Specification
3. Background
   a. Team Division
   b. Task Division
4. Project Management
   a. Team & Task Management
   b. Version Control System
5. Prototyping

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MOTIVATION

- Course: 3D Advanced Interaction
- Projector based Augmented Reality (AR) video game
- Digital Engineering project for 12 CP
    - Combination of Hardware and Software
    - Game Engineering is multidisciplinary

AGENDA

INTRODUCTION

- **Hardware:**
  - SensFloor
  - 2 Projectors
    - On Wall
    - On Floor
- **Software:**
  - A game prototype
  - 2D and 3D
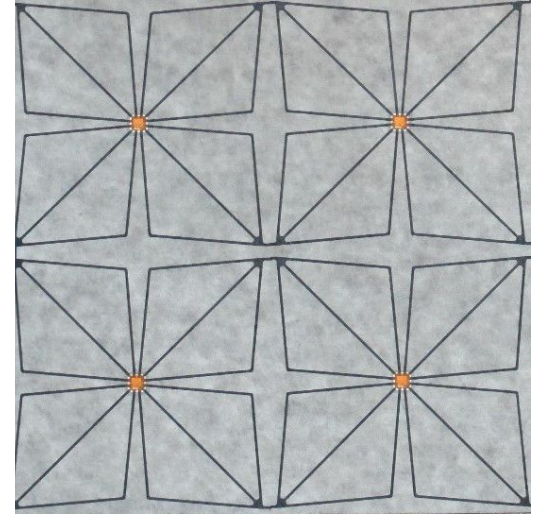

SensFloor

Projectors

INTRODUCTION

- **Survey Museum:**
  - Visited 7 museums within Germany (Technical & Science).
  - Gathered requirements to make a game design.
  - Picked one museum for prototyping purpose.

- **Software Requirements Specification:**
  - Nature Museum Magdeburg
  - An educational game for kids - Tundra Game Idea

AGENDA

BACKGROUND

- Timeline:

| Apr '16 | | 6 CP | | V1.0 | | Oct '16 | | 6 CP | | V2.0 | V3.0 | Jan'17 | Feb '17 |
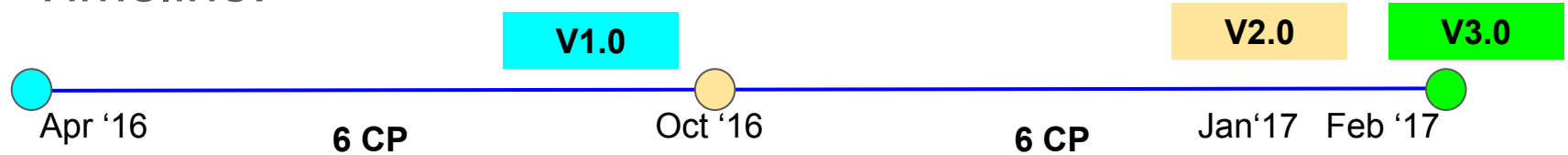
- ○ Start date: 15th April'16
- ○ End date: 23rd Feb'17
- ○ Two-semesters
  - ■ Two different teams
  - ■ Same topic

BACKGROUND

- Team Division

Team 1 (Apr'16 - Oct'16)	Team 2 (Nov'16 - Jan'17)
Developers: *Asema Hassan (Project Leader) *Marleen Rohde *Michael Kropp	Developers: *Asema Hassan (Project Leader) *Stefan Schwarz *Kay Illner
Designers: *Nicolas Pepping *Mareike Gabele	Designers: *Robert Wlcek *Stefanie Vogel

BACKGROUND

- Task Division

Team 1 (Apr'16 - Oct'16)	Team 2 (Nov'16 - Jan'17)
Developers: *C++ Plugin *3D Runner gameplay *FishPond 2D *Menu *Highscore	Developers: *CSharp Plugin *Scalable to any floor size *Improved 3D Runner *Path Following *2D - Sound feedback
Designers: *Story *Basic HUD *Sounds *Menu *Highscore	Designers: *New HUD *Menu *3D Terrain *3D models *UI elements *Sounds SFx/VO

BACKGROUND
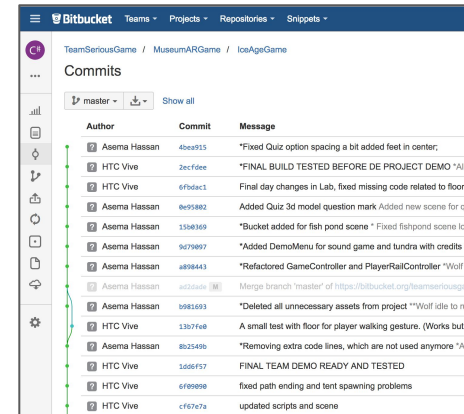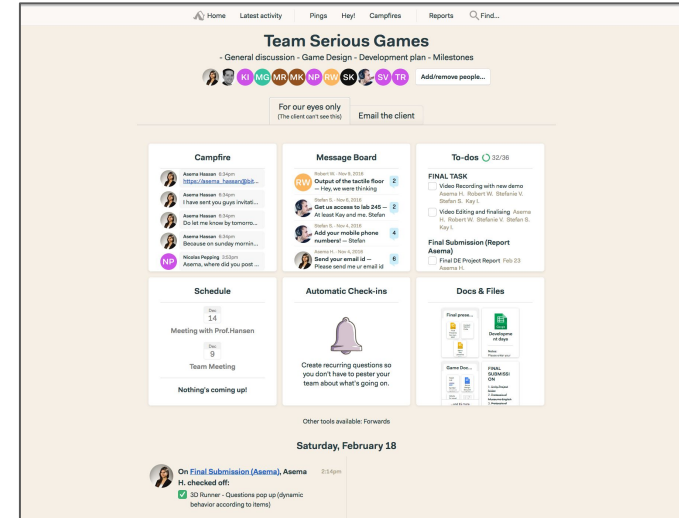
- Task Division

Team 1 (Apr'16 - Oct'16)	Team 2 (Nov'16 - Feb'17)
Developers: *C++ Plugin *3D Runner gameplay *FishPond 2D *Menu *Highscore	Developers: *CSharp Plugin *Scalable to any floor size *Improved 3D Runner *Path Following *2D - Sound feedback *Player Gesture Controls *Quiz Learning *3D Models for items (quiz,fish, berries) *UI feedback elements *Sounds integration
Designers: *Story *Basic HUD *Sounds *Menu *Highscore	Designers: *New HUD *Menu *3D Terrain *3D models *UI elements *Sounds SFx/VO

AGENDA

PROJECT MANAGEMENT

- **Basecamp3**
  - Project management tool
  - Team/Task management
  - History of all changes
  - Documentation
  - Survey records
- **Bitbucket (Git)**
  - Version control system
  - All code is up-to-date
 - Build ready to play !

AGENDA

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Game Design

- **Basic Idea** from the Nature Museum Magdeburg - A Tundra game.
- **Team 1:**
  a. A lost player in tundra, has to run to reach his home.
  b. Survival by collecting berries and fishes.
  c. Linear level, straight Path towards home.
- **Team 2:**
  a. A lost player with his dog, has to run to reach his home.
  b. Survival by collecting berries and fishes.
  c. Answering some questions (Learning factor)
  d. Following his dog (/wolf) on randomly generated path.
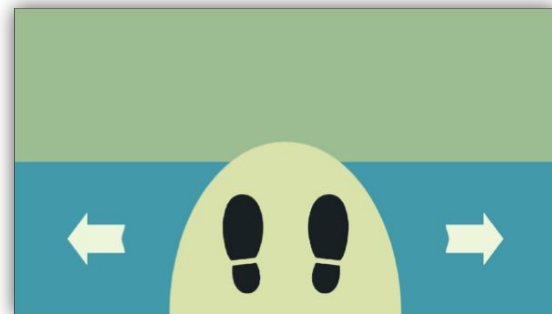
Game Design - Team 1

3D Runner Scene
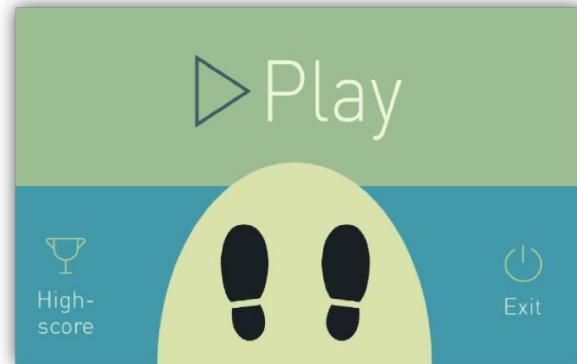
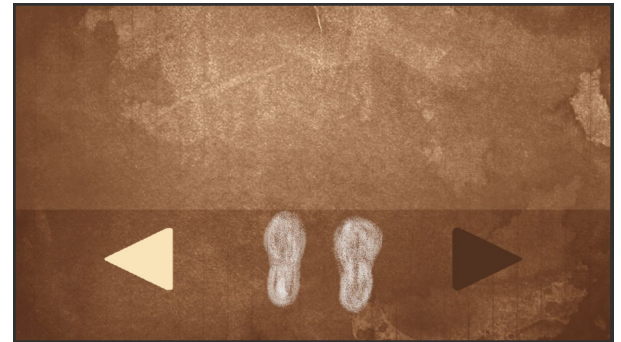

Menu Floor UI

Runner Floor UI
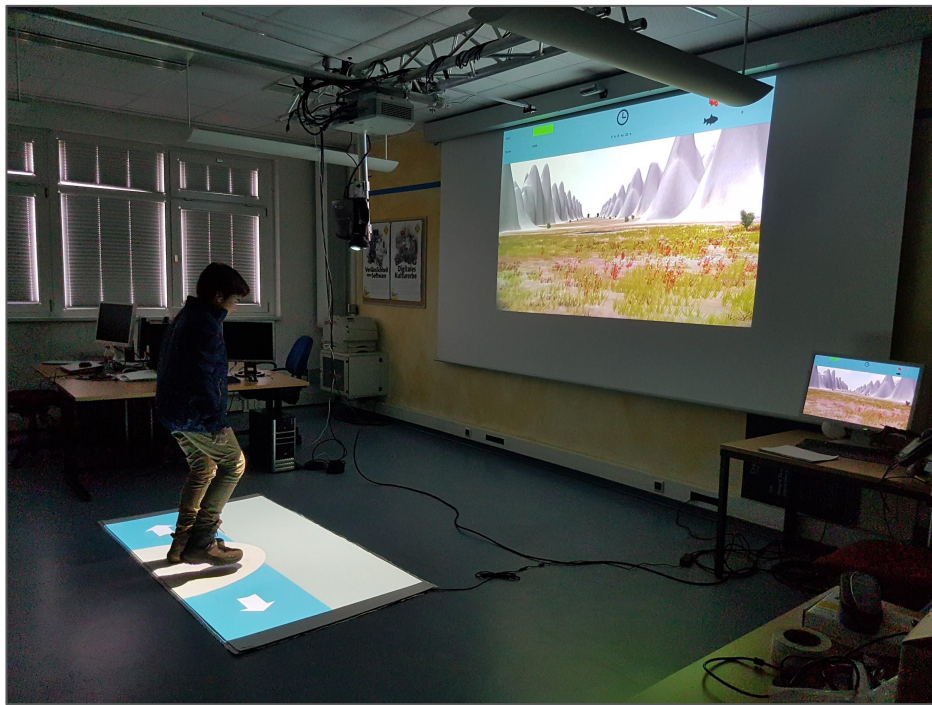
Game Design - Team 2

3D Runner Scene

Menu Floor UI

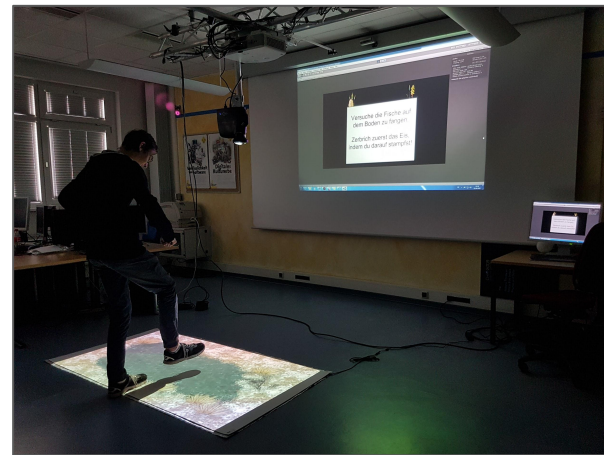Runner Floor UI

Demo Video : v1.0

3D Runner

FishPond

The demo video is available for reference.

AGENDA

SensFloor: Plugin

Team 1:

- External C++ plugin loaded into Unity
    - **Unstable** (Unity couldn't unload the plugin, frequent crashes)
    - **Unresponsive** (Blocking call created a lag in the floor communication)

Team 2:

- Serial Communication completely handled in Unity
    - ***Stable*:** C# implementation using .NET framework for serial communication
    - ***More responsive*:** Reading happens in separate Thread not blocking the game loop anymore
    - ***More robust*:** Filtering of unwanted messages from SensFloor

Issue: Serial communication is a bottleneck for big floor
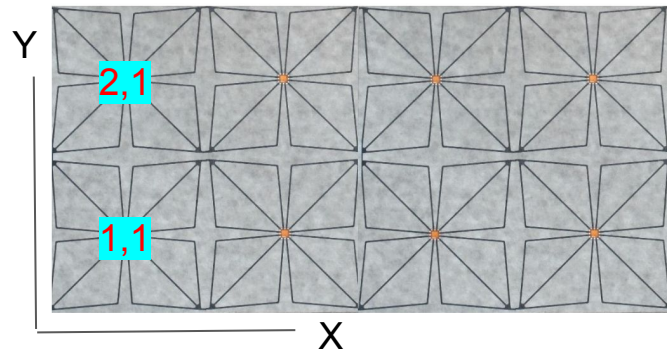
SensFloor: Feedback Test

Sound Game 2D

To test the input data from floor.

Sound game serves as a way to test the interface to the Sensfloor.

Every petal of every flower reacts with a different stimulus combination (color ☐ sound).

Issue:

- Works well without floor input.
- But with floor a stream of data cause multiple playing of sounds (noise).
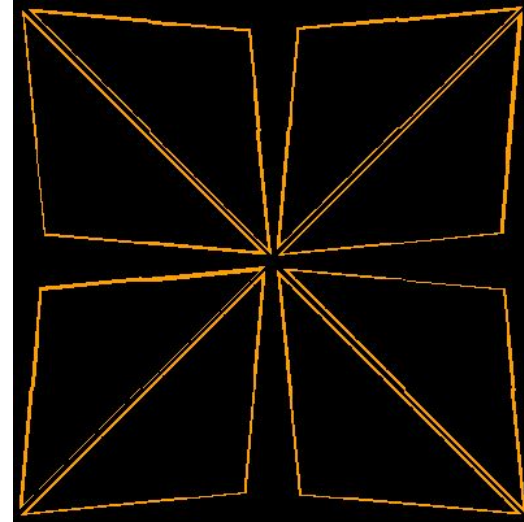
3D Runner: Refined

- Player is following a dog/wolf back to camp where he belongs.
- On his way can collect berries for energy.
  - Red - Poison
  - Black - Good
- Collect fishes from pond.
- Answer some questions about Tundra.
- Can't leave the path;
  - Strafe Left
  - Strafe Right

Issue:

- Sometimes a part of path is generated outside terrain bounds.

Goal

Dog's path

Bounds of walkable path

Gameplay object
(fishpond / question / berries)

Start

3D Runner: Refined

Mechanics

- Camera *following* predefined path
- *Custom* path generation algorithm
- Player only moves forward when do a *walking gesture* on floor.
- If only player moving forward can strafe *left* or *right* using floor input buttons.

Issue:

- Lag in walking gesture.
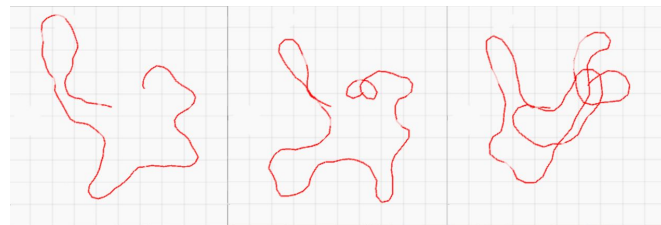
User Interface

Visual feedback

- Added pressed state for every UI element.

Sounds

- When UI element is pressed a sound effect should play to indicate its state.

Issue:

- Works well without floor input.
- But with floor a stream of data cause multiple playing of sounds (noise).

Quiz (Learning)

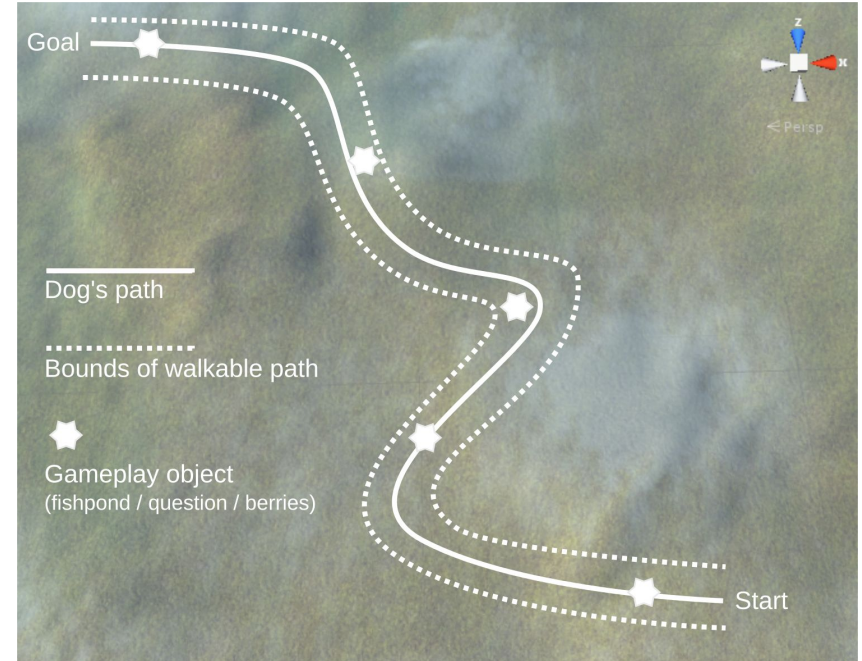**Educational Game**

- Question data generated in sequence
- with 4 options (only 1 is correct)
- Player has to answer question to move forward in game.
- Correct answer adds +5 points.
- Wrong answer shows the correct answer
- with 0 point.

At Present:

- Five different questions, asked in a sequence.

Frage:
Welche Pflanzenarten aus der Kältesteppe wurden im Spiel vorgestellt?

A: Sumpfporst

B: Riesen-Schönmoos

C: Bärentrauben

D: Kuhschellen
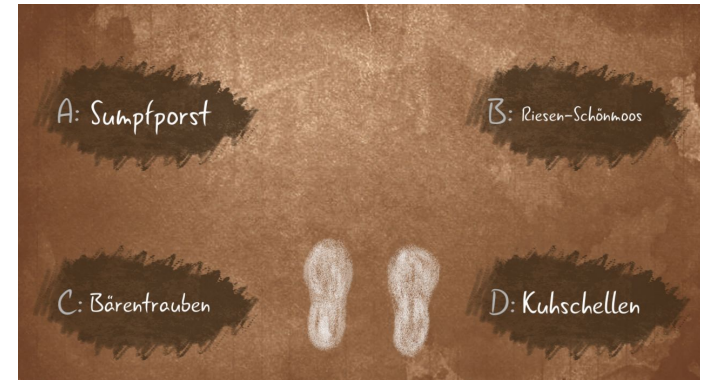
Problems

- **Technical**
  - Serial communication is a bottleneck for big floor (size).

  - Floor data not being reset from last input.

  - A stream of data cause multiple playing of sounds (noise).

  - A part of path is generated outside terrain bounds (random).

  - Lag in walking gesture, not the best solution to halt step movement with time.
- **Projection**
  - Shadows on floor

Future work

- **Improvements**
  - Always a chance of improvement since its prototype.
  - Better control of player walking gesture (No lag).
  - Less spawning of items (frequency).
  - A proper dynamic data manager for quiz generation (file loading).
  - Path generation improvement (within terrain bounds)
  - Noise data filtering from the SensFloor.
  - Playing sound effects without noise/repetition for UI from SensFloor.

Potential

- **Projector based games**
  - Interactive floors
    - http://lumointeractive.com/interactive-floor-projection-display/
  - Interactive walls
    - http://lumointeractive.com/interactive-wall-and-window-displays/

Submission

Prototype V3.0:

- Final Build
  - SensFloor_DEMO
    - Credits
  - 2D Sound Game
  - 3D Runner Game
    - Main Menu
    - Runner
    - FishPond 2D
    - Quiz
    - Highscore
- Documentation
  - Final Project Report (All previous as archives)
  - Final Presentation (All previous as archives)

Submission

Prototype V3.0:

- Project Code
  - All Refactored.
  - All Assets are included.
  - All commented in code.
  - A TODO.txt contains all information
    - About all Features
    - About developers who did.

A link to project private repository will be shared with Prof. Hansen.

Live Demo

- Thank you so much for your attention !
- Any questions?