Collision Detection in VR

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Outline

Motivation

- Collision detection is a critical technique of user experience in VR.
  - Collision between the users and the objects.
- An user should receive feedbacks while the avatar touches the objects or other users.
  - Be blocked, shaked or the vision feedback.

Current Status

- Online 3D games
  - Some MMORPGs don't handle the collisions between users.
  - Others wraps the characters in cubic or sphere bounds, which makes collision detection much easier.
- VR Application
  - An user interacts with objects using the controllers.
  - There is more complex in multiplayer VR application because of the user experience.

Project Goal

- Evaluate the amount of resources required to perform collision detection between user avatars in a social VR application on cloud server.

Server

- Set up the server.
- Receives sensor data from clients.
- Performance of collision detection.
- Monitors the usage of each resources.

Client

- Send data to server: position, orientation and body information.
  - Two or Three real users using keyboard and screen to demonstrate the performance.
  - Lots of artificial users to test the scalibility.
  - Every user has artificial parts with random path, like arms or legs.
- Receives information from server.
  - The information of other users and objects.
  - collision detection.
- Display

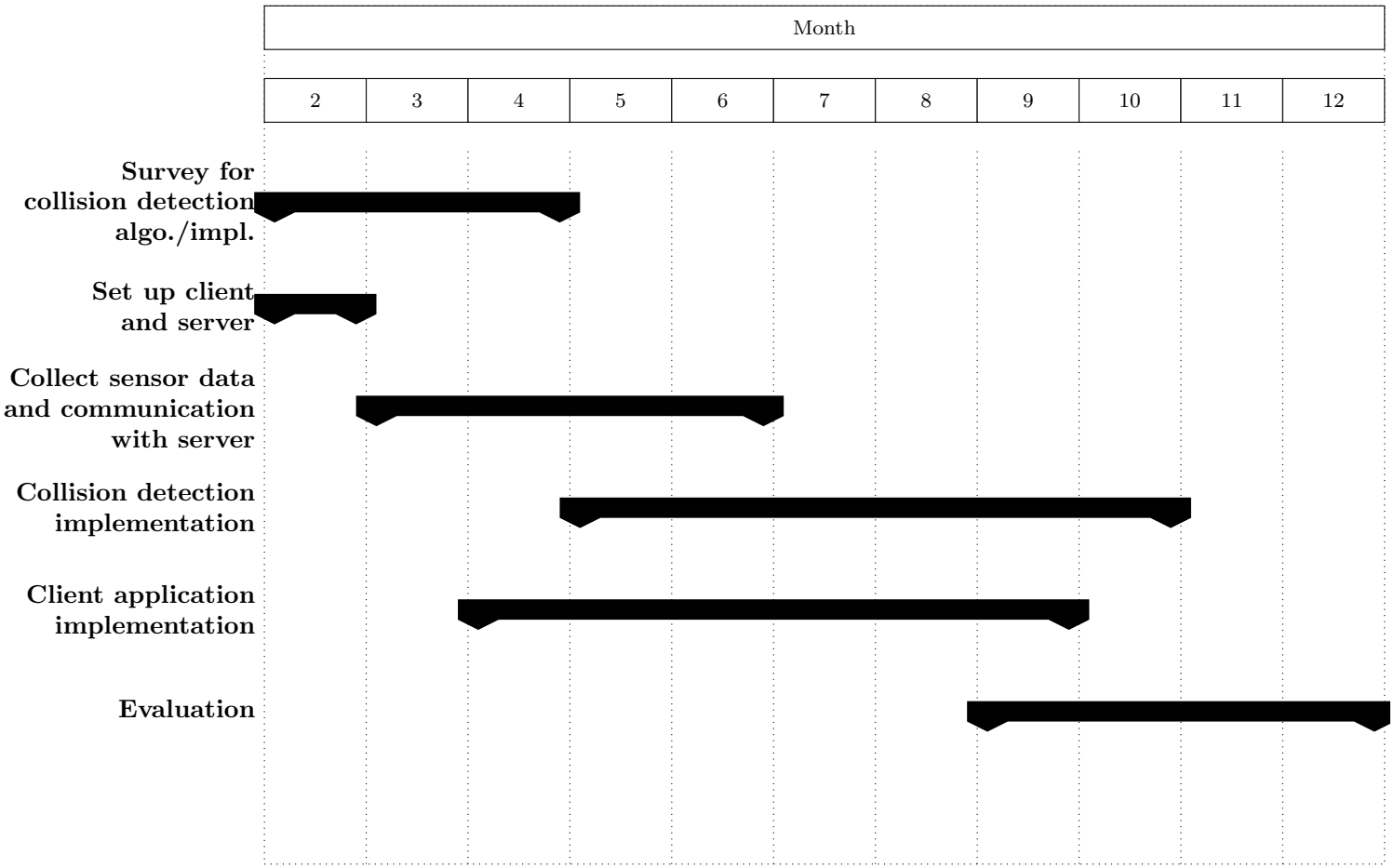
Evaluation

- System scalibility
  - Increase the complexity of bounds on avatars and the number of users in limited resources.
  - Resource management.
- System stability
  - Correctness
  - Time consumed.

Expected Deliverables

- A better collision detection algorithm in parallel and distributed system.
- A simple application with GUI by Unity 3D.
- Experimental data.

Gantt Chart


Month
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Survey for collision detection algo./impl.
Set up client and server
Collect sensor data and communication with server
Collision detection implementation
Client application implementation
Evaluation

Reference

- Perfomance comparison between state-of-the-art point-cloud based collision detection approached on the CPU and GPU
  - from IFAC-PapersOnline
- HMD Initialization and Sensor Enumeration Documentation
  - from Oculus.com https://developer3.oculus.com/documentation/pcsdk/latest/concepts-sensor/
- Algorithms in Game Engine Development
  - http://www.haroldserrano.com/blog/algorithms-in-game-engine-development
- Collision Detection from *jeffThompson on GitHub*
  - *https://github.com/jeffThompson/CollisionDetection*