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Managing Massive Multiplayer Online Games
SS 2019

Exercise Sheet 1: Modelling of Time
The assignments are due May 8, 2019

Assignment 1-1   *Time*

Consider an abstract game where the goal of two players $\{S_1, S_2\}$ is to collect as many coins $\{m_1, ..., m_9\}$ as possible. Each coin can only be collected once, if two players want to collect the same coin at the same time, the coin is divided and the score of both players increases by half a coin. Winner is who has most coins eventually.

We assume a client-server architecture where a player S_i sends an action request of the form $Collect(m_j, t, t')$ via his client to the server. m_j is the ID of the coin that player S_i wants to collect, t represents the time when the client sent his request and t' is the time when the request arrives at the server.

Consider an instance of this game in which the following action requests are sent.

Player S_1		
Coin	Time (Client)	Time (Server)
m_1	1	4
m_2	2	3
m_3	3	4
m_4	4	6
m_5	5	8
m_6	6	7
m_7	7	8
m_8	8	10
m_9	9	11

Player S_2		
Coin	Time (Client)	Time (Server)
m_1	1	8
m_4	1	7
m_3	2	10
m_2	2	9
m_8	2	9
m_7	3	10
m_9	3	11
m_5	4	10
m_6	4	13

How many coins do the players have at the end of the game when using the following models of time:

(a) Turn-based (alternately): Before a player can perform an action she has to wait until the other player has finished her action. Player S_1 begins. If a player wants to pick up a coin which does not exist any more it is her move again.

(b) Turn-based (simultaneously): In each round pairs of players' actions are performed simultaneously. Players have to wait for the other players' actions.

(c) Real-time (Server-sided): Action requests are executed immediately when they arrive at the server. If a coin should be picked up which does not exist any more, the request is discarded.

(d) Real-time (Client-sided): Action requests are collected by the server and then executed in the order in which they were sent by the clients. If a coin should be picked up which does not exist any more, the request is discarded.

Discuss the advantages and disadvantages of these models!