



Stimulating collaborative activity in online social learning environments with Markov decision processes

Matthew Yee-King and Mark d'Inverno, Goldsmiths, University of London

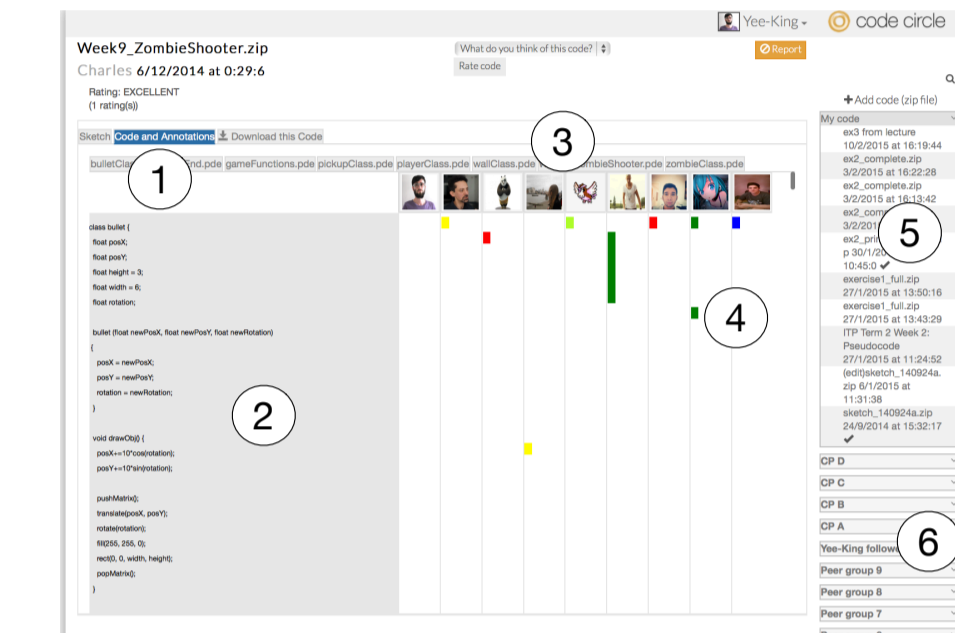
Research Question

How can we increase student engagement in social learning activity?

Motivation

- interested in online social learning + feedback
- want to design better feedback systems
- how to implement systems in blended learning?

Data set



- 174 CS UG
- 10 weeks
- Sharing and discussing code
- Using codecircle our own system

What is MDP?

Decide which action to take in a given system state to maximise future reward for minimal cost

MDP model for social learning

State	read code	login	open thread	pre-comm	run code	Observations
content consumption levels	0	0	0	0	0	973
0: low	1	0	0	0	1	60
1: medium	1	0	0	0	0	59
2: high	0	0	0	0	1	51
	2	2	2	2	2	50
	state					

Action	comment	reply	share	grade-comm	grade code	Observations
content creation levels	0	0	0	0	0	1621
	0	0	1	0	0	109
	0	0	2	0	0	54
	1	0	0	0	0	23
	0	0	0	0	1	12
	action					

SxA -> S

"20020x00000" : {
 "02002" : 0.5,
 "02222" : 0.5
 },

Reward for action

$$r = \sum_{j=1}^M p_j \cdot v_j$$

actions leading to high activity are good

Cost

$$c = \sum_{k=1}^K (s_k + 1 - p_k)$$

rare actions are expensive

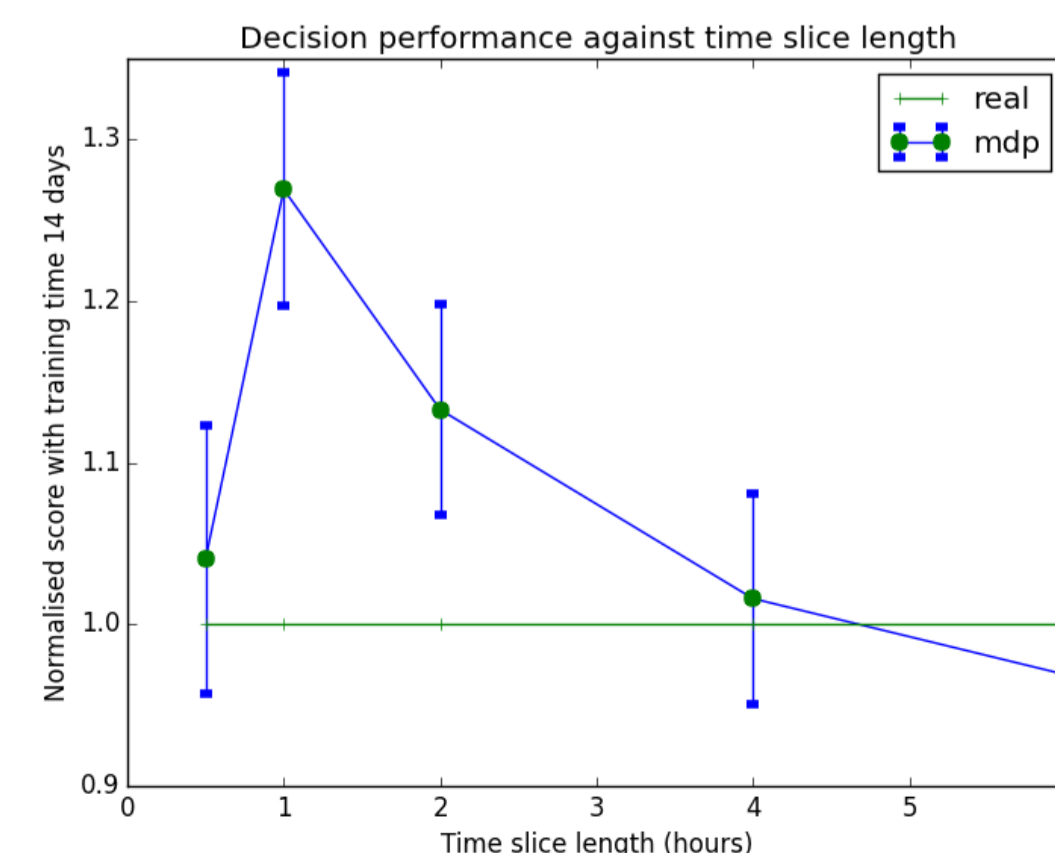
Results

action policy extract

action	read code	login	open thread	pre-comm	run code	comment	reply	share	grade-comm	grade code	
0	0	0	0	0	0	→	0	0	0	1	
1	0	0	0	0	0	→	0	0	0	1	
2	2	2	2	2	2	→	2	0	0	0	
1	0	0	1	1	1	→	2	0	0	0	
2	1	2	2	2	2	→	0	0	2	0	
	State						Action				

Validation

Trained on observed state transition matrix, tested on unseen matrix



The suggested actions lead to valuable states: high activity

Next steps:

- Convert to xAPI
- Use the action policy to decide actions with a real cohort