PhD Open Days

Group Interactions Management for Multiplayer sErious games

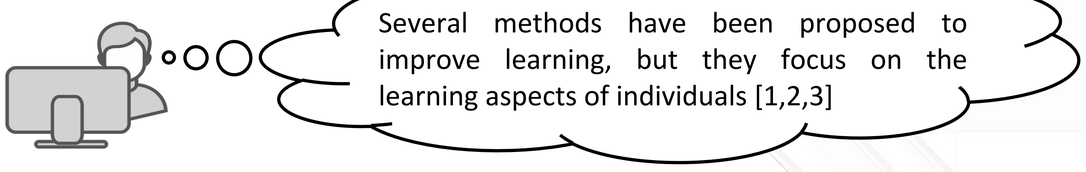
PhD in Information systems and Computer Engineering

Samuel Simão Canada Gomes (samuel.gomes@tecnico.ulisboa.pt)

Goal

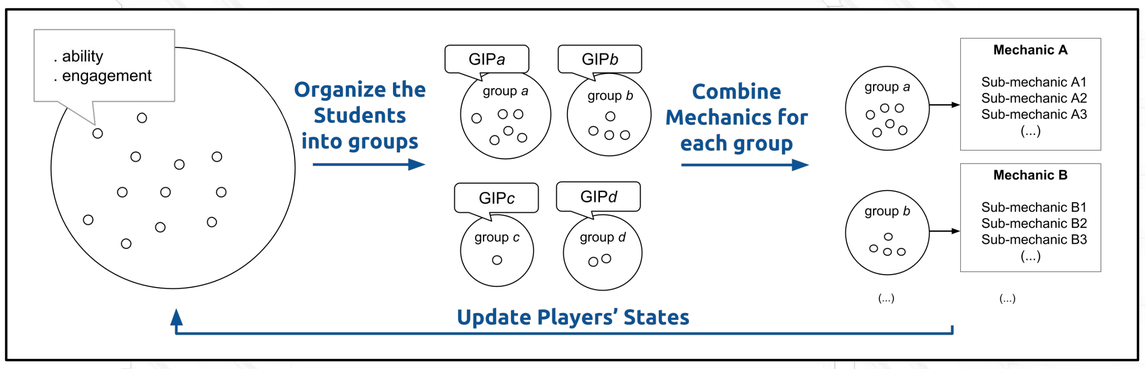
An emerging problem approached in education research is:

How can the collective ability of a student class be improved using an automatic adaptive system?

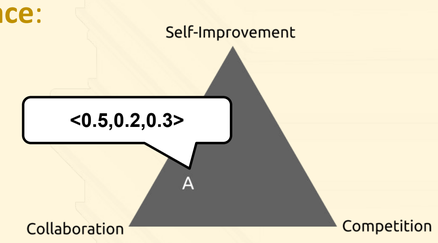


We propose **Group Interactions Management for Multiplayer sErious games (GIMME)**, a methodology which **explicitly analyses and promotes specific interactions in groups**. It operates in three steps: **(1) Dynamically extract and update the students' characteristics**, **(2) Organize the class into groups, building for each group a Group Interactions Profile (GLP) to represent the types of interaction needed so that collective ability is increased** and **(3) Adjust game mechanics based on the GIP and characteristics of students in each group.**

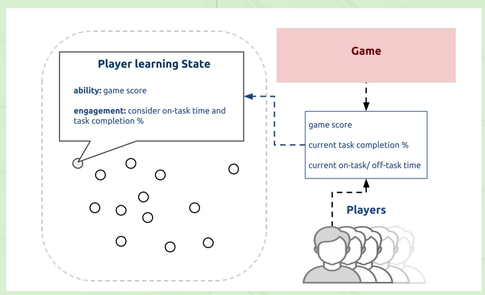
GIMME



We define a **GIP** based on three basic types of interaction: **Collaboration**, **Competition** and **Self-Improvement. These 3 dimensions form a triangular space**:



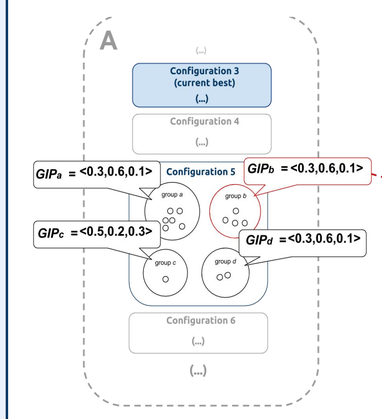
The first GIMME step is to extract and update a student's **Player Learning State (PLS)**: his/her **ability** and **engagement**:



The second GIMME step is to organize students according to their **PLSs:**

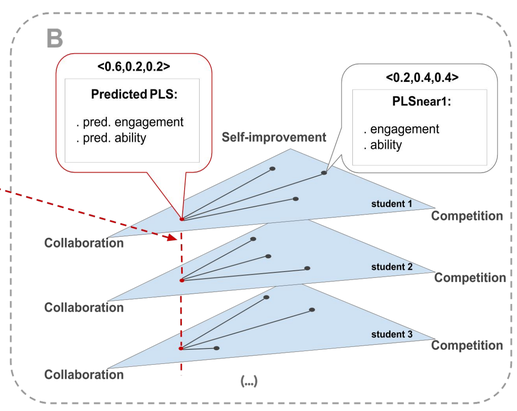
Generate random configurations

Keep the configuration which maximizes both the **ability** and **engagement** of the students.



Compute the quality of each configuration by predicting the next PLSs of the class considering older ones

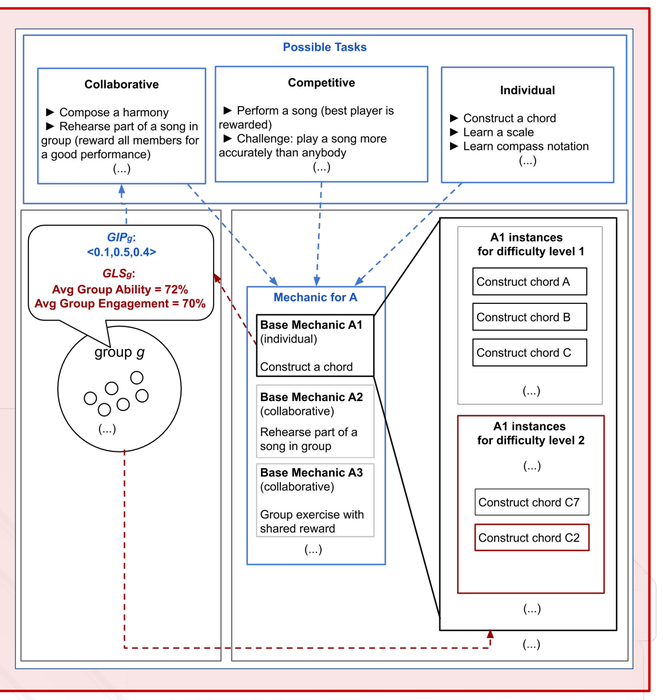
Predict the next PLSs using, for example, a supervised machine learning algorithm. In a preliminary implementation, we used *KNN for regression*.



The last step of our method consists in **translating a group's GIPs to game mechanics**. To do so, we combine *n* mechanics tailored to our basic types of interaction.

Mechanics for collaboration and competition have already been proposed [4, 5, 6].

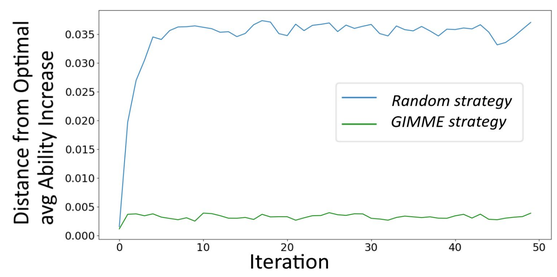
The amounts of the *n* mechanics promoting each behavior type are selected according to the ratios present on the **GIP**. Additionally, the tasks' difficulty can be tailored to the student's **PLS** through mechanic instances with different difficulty levels, acknowledging flow theory [7].



Preliminary Validation

We performed several agent-based simulations in order to validate certain aspects of the model. This way, we could perceive some of its capabilities, possible refinements and improvements. The simulations showed that the average ability increases of the players rapidly converged to near optimal values when using our strategy, as opposed to a random baseline which maintained low values. Moreover, unlike the random strategy, our method managed to considerably approximate the promoted learning profiles to the players' preferences (this was reflected by low distances between the preferences and promoted profiles points in our **adaptation space**).

Comparing GIMME's optimality through the avg ability increases:



Comparing the differences between avg preferences and promoted profiles:

Future Work

- ➔ Application of our model in a real scenario
- ➔ Using an evolutionary process while generating samples in the group organization phase
- ➔ Using a grid when storing past profiles so that better coverage is achieved

References

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TÉCNICO LISBOA

inesc id lisboa

Work supervised by:

João Miguel Dias, Carlos António Roque Martinho

(PhD in Information systems and Computer Engineering)

phdopendays.tecnico.ulisboa.pt