Delegating Subtasks within Student Projects – fair division

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The motivation

- The course is
  - “Intelligent Systems”
  - elective course
  - taught at the FCSE in Skopje, Macedonia.
- The projects are compulsory part of the course
- Interesting, real-life projects

  Pattern recognition

  Prediction

  Image processing

  Sound processing

  Bioinformatics

The Outline

- Situation with the course until last year
- Problems with projects
- New approach to solve problems with delivering the project results
- New methodology based on FAIR division theory
- Semi-implemented 2014/2015
- The outcome
- Students opinion
- Conclusion and Next steps

The situation?

- Traditional approcah
  - We gave the freedom to the students to choose
    - *their favorite project*
    - *The team (4 - 5 students)*
    - *Delegatin of subtasks – free, among the group (selfdelegation ☺)*
- Experience
  - Most of the times only 1 (or 2) student(s) do all the work
  - Claiming everybody was involved
  - All of them getting the same credits
  - Choosing the ‘easiest route’, even good students are choosing the subtasks
  - Subtask scheduling - a black box for the teacher.

The result is…

- Activating all attendees at the course is not achieved!
- inconsistency in the project's quality **- does not guarantee that it will be successfully finished !**

Now what?

– To avoid the ”easiest route” approach for choosing the subtasks, we propose **a fair division strategy**

1. To activate **all** involved students

2. **GET the work done (finished project) with the best (possible) quality**

Original methodology

- We created an original methodology that analyzes students activities during **the first half of the course**

and

- **suggests the most suitable subtask delegation within a project**
  - **Most sutable → using mathematical formula ☺**

The implementation

- The projects - divided in finite number of homogeneous subtasks, so we can have control for a given subtask
- Gets more complicated - the teams are comprised of students with different course performance background
  - Allowing the students to choose a subtasks by their own preferences is very likely to end up with insincere choice that is not consistent with their skills

Fair division theory - questions to be asked

- WHAT are the true preferences and how can we guarantee fairly subtasks delegation and achieve efficient team work?
- Bouveret and Lang in their paper - **setting the scene** for developing an appropriate fair-division strategy:
  - What is the nature of the resources to be allocated?
  - What is the nature of the preferences of the agents (students)?

Setting the scene

- We define a course project to be a divisible resource that results in **five unequal units**
  - subtasks that can no further be divided
  - each subtask requires different effort (skills) to be solved.

The strategy

- Each course project is assigned to a team of students (agents).
- Because projects are consisted of five indivisible subtasks,
  - *each team must be comprised of exactly five students*
- The projects' subtasks are numerically ranked by the professor, considering their contribution for the overall project success.

X={management, data analysis, data processing, related work, data preprocessing}

- The success of each subtask highly depends on the others subtasks success, sequentially

The main question: how to delegate the subtasks?

- Again, **the goal** - full involvement of the students and finishing the project with the highest possible quality.
- Our methodology
  - Delegation - according the profiles of the students
  - Profiles – according their success in the course UNTILL the project assignment
    - *Mid semester, after the first partial exam*
  - Success – e-assessment results, lab exercises, seminar work, first partial exam

Fair division – subtasks delegation

- **Student preferences according their profiles– is it the best way?**
  - We could ask the best students to choose freely, but, if they choose the easiest subtasks, we wouldn't be sure for the quality and finalization of the project

  That's why de decided to:

  - *The most challenging subtasks (the most rewarding ones) are for the best students*
  - *Higher scored profile → delegated task with more responsibility → more benefit for the course final score*

The subtasks

1. Management (30%)
2. Data Analysis (25%)
3. Data Processing (20%)
4. Related Work (15%)
5. Data Preprocessing (10%)

1. First step: building the students profiles - midsemester

We consider the results from

- the first partial exam (PE)
- classes attendance (CA)
- laboratory exercises (LE)
- seminar work (SW)

} technical score

- quantum of emotional intelligence (EQ)

} subjective value assigned by the teacher

Profle (s) = 0,3* PE + 0,2* CA + 0,2* LE + 0,1*SW + 0,2*EQ

2. Delegation of tasks

- … according the outcome of the student profile, we delegate the tasks WITHIN a chosen project

1. Management
2. Data Analysis
3. Data Processing
4. Related Work
5. Data Preprocessing

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Setting the scene…2014/2015 (simulation)

- 35 students enrolled the course Intelligent system 2014/2015
- 7 projects, 5 students each
- We offer the top 7 students to pick their favorite project and delegate the highest ranking position – MANAGER
- Then all the other students choose project they like the most, grouped as they want
- Within a project, the rest of the subtasks is delegated according the Profile score

The expected outcome

- … **SUCCESS!**
- This methodology would enable finishing the projects in a more efficient way compared to the traditional approach
  - producing structured documentation
  - source codes delivered on time
  - clear distinction of each student participation within the assigned project.

Let’s hear the students side of the story…

- To check and compare each student's personal preference for a subtask we provided a **survey among the students**.

- We compared each student's personal preference for a subtask with the actual delegated subtask.

Sooo ….

Management 100 %

Data analysis 95%

Data processing 90 %

Related work 0%

Data preprocessing 0%

Can we benefit from this result?

- **YES!**
- The students choice clearly supported the distinction between the Management subtask and the technical ones and it corresponds with our methodology of the subtasks division,
- BUT, all the students has chosen **only the highest valued technical subtasks**.

The conclusion

Old problem – delegation of the subtasks within student projects

New strategy to …

avoid the “easiest route”

finish the project with the best possible quality

Fair division, to be fair according the abilities, envy free and EFFICIENT

Delegation of subtasks – according the students profiles → SUCCESS!

NEXT STEP …

Reduce the technical subtasks only to Data analysis and Data processing, assuming that **Related work** and **Data preprocessing** will be included as their integral part.

Thank you !

Questions ?