Software Engineering Project

Description of the project:

General overview:

High quality and affordable 3D scanners have now become very familiar in many aspects of our everyday lives and are no longer restricted to industrial or academic applications. It is now well understood that 3D printing, augmented and virtual reality are much more than promising technologies and that affordable and meaningful 3D content is urgently needed.

One way to produce content is 3D scanning of real life objects. More precisely, 3D scanning of people is one of the most interesting applications. However, 3D scanning of people is very challenging if you want to achieve a repeatable level of quality at a certain speed, except for when you have a 3D scanning rig, which combines point-and-shoot functionality with portability

Context:

This project is a joint project with Alexander Hermanns, from the company Agile Source. Alexander has developed a scanner rig composed of a turning table and a mobile sensor (Kinect v1) that allows for the 3D scanning (geometry and texture) of people. The acquisition and the processing of the data is performed through a software called skanect (http://skanect.occipital.com/).

Objective

The main objective of this project is to replace the skanect software by our own, home-made acquisition and processing software so that we no longer depend on proprietary software. Material and financial resources will also be made available so that functional prototypes can be constructed by the students.

Practical organization

Students will be spread within **4 groups**, each group being composed of approximately 10 students. The groups will be designed so that the **representation of the cursus of the students remains homogenous** (MsCV, Vibot, MAIA)

Each group will be assigned a budget and will carry on the project independently. The internal organization, planning, and hierarchy will be the responsibility of the group. Tutors (YF, CJ) will be part of all the groups and will only impose decision for the groups in case of conflicts or inability of the group to take actions.

The project is designed to be completed over 12 weeks and is supposed to start on October the 1st to be finished during Christmas vacations. Defense

and presentation will be held in January.

Three tutors will also be members of all the groups, namely Yohan Fougerolle, Cansen Jiang (former MsCV student, actually in Ph.D), and Alexander Hermanns.

Some time slots for discussion with the tutors will be arranged on a bi-weekly basis or upon groups' request.

Evaluation and grading

All the students within a group shall be graded equally. The mark obtained will be the smallest mark within the group. This is done on purpose so that the groups cannot "let someone behind" and have few students to implement the project alone while others are excluded or do not work actively on the project.

If all the students in a group agree, some adjustments can be done to reward extra points for outstanding commitment (or inversely, some points might be substracted in case of lack of commitment).

The group will be evaluated as follows:

1. Technical quality of the project (50%). This includes the quality of the implementation (including comments and explanations), le level of functionality achieved by the software, the easiness of use, the quality of the user interface, etc.
2. Project Management (25%). This includes the proper planning of the project, its realistic implementation and timely reach of the project milestones, the respect of all the deadlines, and the **equal share** of the workload between the students. In case of unsolvable conflicts that require the tutors to take actions (such as swapping students or rearranging groups), some points will be deduced from the final mark.
3. Reporting and Defense (25%). Report must be written using LaTeX and present in detail all the technical aspects of the implementation. The defense will be held on January. Each group will have an equal duration (to be adjusted depending on your needs) to present their software, implementations, and any other aspect deemed as important.

Required features and guidelines

Each group will have the opportunity to propose, then develop (if accepted), any functionalities deemed necessary to the software. However, the project must respect the following criteria:

- Acquisition duration must not exceed 90 seconds in total
- Various processing of the data can be performed offline
- The system must provide watertight triangular meshes
- The system must allow for the import and the export of 3D textured meshes
- The user interface must allow for the visualization (or preview), even roughly, of the scan and individual acquisitions. Some additional

processing and edition (remove parts, smoothing, do/undo, etc.) can be implemented once agreed by the tutors (YF, CJ, AH)
- All the groups must agree on the same sensor for the project. Several sensors are possible and have to be discussed with tutors
- Implementation must be in C++ only. IDE can be Qt or Visual studio (whatever you choose, please ensure you can recompile your code interface in both IDEs). OS will be Windows only.
- The usage of extra libraries such as Point Cloud library, Eigen, etc. Is allowed but it must be discussed with the tutors beforehand.

Advices

The groups are allowed to collaborate, and some parts of the project can be developed jointly (once agreed with tutors). Collaborative work and active attitude toward the exchange of knowledge (seminars, tutorials, code examples, group discussion) will be awarded extra points.

Please **learn to listen to each others**, and accept that people might work differently from you. This is very important, and you will soon realize that there exist strong differences (temper, culture, etc.), so always take the time to discuss rather than argue.

This is a very ambitious project and all of your soft skills (communication, ability to work in group, ability to listen to the other, planning, etc.) will be crucial. If you want to hear about funny stories about this, simply ask to the former BsCV students... **Pay a special attention to the project management and the spread of the workload**. Be sure that you are comfortable in your role within the group.

Do not hesitate to seek for help. Do not hesitate to learn from your teammates: it's not because you do not feel skilled in one field that you cannot try something within this project. Try your approach and simply team up with someone else in your group who can show you how to progress.

Pay also attention to over-commitment, exhaustion and health issues. Soon, you will have to work on many other projects, courses level will raise, weather will become cold, and you can quickly get a cold which will make the whole much more difficult. Manage your time, spare your efforts, avoid coding late at night, etc. Oblige yourself to sleep at least 6 hours by night, rather than in class...

Never hesitate to ask for feedback and guidance, but avoid seeking for ready-to-go solutions. Please use our Edmodo platform for question so that all of us (including tutors) can benefit from the answers.

Most importantly, enjoy!