Background Information

Client: **Questacon - The National Science and Technology Centre**

Background:

Using interactive and immersive open-ended learning methods to instil excitement and curiosity in visitors, Questacon breaks down complex science topics and phenomena.

Our latest project is a new exhibition on the convergence of humanity and robotic technologies. As part of this exhibition we are delving into the aspects of robotics that are becoming more complex, more 'human-like' to show the ever shrinking gap between ourselves and robots. To contrast with these qualities we are exploring how robots are also limited by their programming and are only capable of doing what they are told to do by us.

Introduction:

We are currently looking for a means to deliver an interactive experience involving swarm-based robotics that displays this complexity whilst also highlighting the human element required to make it function.

We would like to work with an ANU Techlauncher team to develop an interactive exhibit that allows visitors to draw simple pictures on a screen and watch as a wall of coloured robots **quickly rearranges itself to match the pattern**.

Our desire is to reach at least a practically feasible proof of concept that we can use to produce a finished exhibit to coincide with our 2019 exhibition.

Approach:

During concept and development of the exhibit Questacon's design team will be available for discussion and feedback to refine the ideas and specifications. We encourage blue sky thinking and creative problem solving in the development of our exhibits, with practical outcomes and visitor interactions as key considerations during development. Considerations for ongoing maintenance are also extremely important in developing long lasting robust experiences.

References:

Kilobots by Harvard are a form of swarming robot on a horizontal plain that function a lot slower than we need
https://www.youtube.com/watch?v=G1t4M2XnIhI

Zooids from Stanford are fast but are not mounted vertically
https://www.youtube.com/watch?v=_e1Jwueaxhs

Buzz is a swarm programming language. Whether it is useful or not will be up to the Team
http://the.swarming.buzz/

Meeting Agenda

Meeting Date: 2nd March, 2018

Attendance:

        Doug (client)

        Software Team

        Hardware Team

Main

Objective: (to be confirmed)

To develop an interactive exhibit that allows visitors to draw simple pictures on a screen and watch as a wall of coloured robots quickly rearranges itself to match the pattern.

To reach at least a practically feasible proof of concept that we can use to produce a finished exhibit to coincide with our 2019 exhibition.

Add:

client's 3/4 difficulties/:

- recharging, how often wear out

    wireless charging, electricity brush

- vertical
- maintain
- cost
- large scale (at least 3x3)

Client is not fussed about what robots we use, whether existing ones or 3D-printed ones.

Client Expectations:

Find solutions to control approximately 100 robots to move at the same time to form shapes drew from the tablet by users.

Prototype robots which can move along vertical wall.

Preparation for handover to new groups in next semester.

How our project will make things better for clients:

They are facing many difficulties in building the exhibition:

- recharging and battery (how long the battery wears out)

    wireless charging, electricity brush

- vertical mounting
- maintain (easy to replace or repair)
- cost (low cost per item)
- large scale (exhibition is at least 3x3m in size)

Client does not have software and robotic engineers to complete the design for this exhibition. They do not have relevant skills.

Stakeholders: (maybe more to be added)
- Client (Questacon) Doug,
- maintenance, work and health
- Users i.e. children
- Software team
- Hardware team
- Tutors
- Shadows

Milestones & schedule:

Client's timeline is to November 2018

For semester 1: to be discussed

Deliverables:

End of the design project of pixel bots for 2019 exhibition:

Building the robots which are able to move on the wall, to form shapes quickly, to easy to maintain.

Building the interface for users to draw graph on tablets and algorithms for robots to move.

One semester project (to May):

prototypes, giving suggestions for client, push it as far as possible

report detailed suggestions for client

Repository:

gitlab/github

It's is not accessible for client to use Google Drive as they are government employees.

Technical and constraints for client:
- How big does a singular bot need to be?

- Is having the bots vertical needed to be shown for the POC or can we have it as a goal later on in the project?

Resources:

How much exhibit space/floor space will we have?

    not too much, robots are on the wall

samsung tablet provided

Risks:

uni insurance covering the trip to Questacon

Costs:

Will we have POC budget or is there only a budget after POC? $100 microgrant, need to ask the BOSS

The proposed budget for the whole project is $30k~40k. (approximately up to $250 per robot)

If we need to purchase stuffs for this project and get reimbursed, it is better to have a shopping list such that client can make decisions on purchasing

NDA &IP:

Are they ok with us using a public github project for a repository?

open to stakeholders

Re: NDA and IP agreement, client needs to consult with its legal people.

Communication:

working hours via email

Visit Questacon:

separate visits, to meet with different stakeholders at Questacon

Overall Requirements: (derived from project objective; for both teams; need to be analysed)

- Allow user to draw simple pictures on a screen
- Robots move quickly form the pattern
- Vertical mounting
- Easy to maintain

Ethan's Questions (Feel free to message me on Facebook during the meeting) (filled by Daniel):

- Do they have an idea/preference as to what they want the input device/method to be? e.g. Tablet, scanning a hand drawing in.
  - A: They aren't too fussed on what we use, but they did say that they are partnered with Samsung so we can use Samsung tablets.
- What would be considered a 'Proof-Of-Concept' (POC)? I would need measurable metrics.x
  - How fast the bots move(with a rough speed given).
    - A: A minute at maximum to draw the picture.
  - How many bots do they want to see working for POC.
    - A: Enough to show a POC, it could be 4 or 10 but we gotta show its scalable.
  - What drawing resolution is needed(I was thinking a really small 2 x 2 box where the bot would move to a specified location).
    - A: At least 3x3
- How big does a singular bot need to be?
  - A: That's our job to figure it out; whatever we need.
- Is having the bots vertical needed to be shown for the POC or can we have it as a goal later on in the project?
  - A: Yes, if it's not possible to have it on the wall, it's not useful as a POC.
- How much exhibit space/floor space will we have? x
  - A: He doesn't know yet, as we aren't sure if this exhibit will even exist. We won't need much space though.
- What parts of swarm behaviour do they want us to highlight for it to be educational. Is there a particular behaviour that they would like to see? x
  - A: It would be desirable if we can get all the bots to move at the same time.
- Is it possible later(Much Later) to get some people to test it? e.g children and adults.
  - A: If there is something to test, then yes, we do. If there isn't anything to show, then no.
- Are they ok with us using a public github project for a repository? x
  - A: It's ok to leave it open for tutors, but keep it hidden from the public.
- Is there a Non-Disclosure Agreement related to this project? x
  - A: He will have to see the legal guys to check that.
- Will we have POC budget or is there only a budget after POC? x
  - A: For us, 200 bucks (From COMP3500) and an unknown amount from Questacon (we need to find what we need first). For the final actual product, 30,000-40,000 bucks
- Will we be provided with a Samsung tablet for us to work on?
  - A: Yes, they get Samsung tablets for free so they can lend one to us. Since the tablet is still a property of the Government, Doug will be responsible for any damages to it so be careful.
- Doug can provide some documents by email on stuff they already worked on.
- Any further questions, email Doug.

Raw meeting minutes by Yuxuan

Basic underline:

Draw, move the robots

Interest in small robots

Can look for existing robots

Good maintenance, recharging (wireless)

Practical expect: hundreds of robots

Think about how to handover a project to next semester

Try to prototype, e.g. try to find an existing robot, may need some change, cannot be expensive.

Methods: double walls to hold the robots

3 important things: Vertical, recharge, battery (survive lots of time)

(Also with flat surface on top)

Consider the cost

3m tall, large wall

scalable programming (proof of concept), SamSung devicesgoo

Deliver package to next team, due on 12th, November

Solving only some aspects, leave other

Timing: much less than 10 minutes, as fast as possible

Just make simle human interaction, not to confuse them

Not teaching space, it is just interaction, engaging oriented

Clients wants to work independently

Deliverables:

By May, prototypes, suggested requirements (in order to deliver to next team project).

R&D oriented project in current phase.

Require IP to belong to the company, client needs to ask the legals

Update the process in terms of <mark>email</mark>s to the client. All fine to open the resouces to tutors and public.

Limited budget (100$):

Micha wants to ask the price of using 3D printers.

Final budget of the product: 30 to 40 thousnads dollars in the whole thing.

Give a shopping list to the client.

Boyi Chen: When do we visit Questacon? Weekends?

Default is Tuesday. Bringing separately is fine.

Haven't got requirements from maintainence, tehcnicians, constructor.

We should figure out the insurance by our own. Client would ask other about it.

Client: Huge wall is for fun and impact.

Testing: normally with the visitors.

Clients want us to give good advice.

No google drive for clients.

Budget, IP, insurance

Clients later will send <mark>the robot list</mark>