Hackathon Presentation Notes

Michal Spano

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The notes for the project's slides.

Wow message?

1. START: **TODO**
2. END: The 1:1 bracelet from space

Slide 0 - `doubleEnum - SpaceY` [Mariia]

- A welcome message

Slide 1 - `doubleEnum` - Introduction [Mariia]

- Explain **who** we are (rephrase what's on the slide)
- **Emphasise** that we like competitions, Hackathons, etc.

Slide 2 - `doubleEnum` in action [Mariia]

- Present the photos from the Gothenburg venue of the previous round of the event
- **Point out**: brainstorming session(s), sketching the model/prototype

Slide 3 - TEAM [Mariia]

- *"And, above all, here's a team picture of us…"*
  - Or say something similar like that.

Slide 4 ***spaceY - why?*** [Michal]

- Payload ⇒ significant danger (…)
- Space environment ≡ important
- *Inspiration?* A similar scenario - Gravity (movie)

Slide 5 - Motivation [Michal]

- **Explain:** Low Earth Orbit is where majority of our satellites and telescopes are located. Defunct satellites, rocket thrusters, fragmentation debris further increases the object density in the area.
- **Kessler Syndrome**
  - The Kessler Syndrome is a theoretical scenario in which Earth's orbit is overpopulated with objects and debris, preventing the use of satellites in certain sections of Earth's orbit.
- Debris (a lot) ⇒ a non-reversible effect
- **Re-use** of materials from the disposed debris

Slide 6 - Product overview I [Agrima]

- Product introduced in three **main stages**

Slide 7 - Technical requirements Part 1 [Agrima] `WHAT?`

1. **Debris extraction – Problem**
   - 2 types of debris to consider in our MVP: metallic payload and small rocks/ meteoroids.
   - 98% of our debris are under 10 cm.
     – Dimensions of our bot: 2m X 2m.
2. **Movement and Stabilisation**
   - Indeed, to be able to obtain the debris [the robot], the robot needs to ****move**** in a stabilised manners
   - The exact specifications will be addressed by my team-mate Ionel.
3. **Prevent collision damage**
   - With movement comes the **risk of collision with external objects.**
   - This risk has been considered in the technical specs.
4. **Debris transportation**
   - Once enough materials is gathered, the robot is prompted to return (with the material) to the station.
   - We **envision** our end product to be a swarm of robots as it makes it more feasible and practical.

Slide 7 - Technical requirements Part 2 [Ionel] `HOW?`

1. Space has an extremely low pressure and density. Hence, we can conclude it to be a vacuum. Therefore, the law of inertia is respected which we have to consider in the design of our model.
2. We decided to use a gyroscope in our model as the angular momentum is conserved. It will have 3 degrees of freedom. Hence, the bot can rotate about 3 axises.
3. Gyroscopic motion provides stability due to tendency of rotating objects to maintain its orientation of rotation [follows Newton's first law pop motion also known as the law of inertia].
4. There will be 3 Reaction wheels placed in the centre of our model. It has several advantages: it does not consume fuel; it is relatively power efficient; does not rely on the magnetic field. However, a few disadvantages of the same is that it generates micro-vibrations and needs lubrication.
5. The bot will be self powered by solar panels and can also move around via thrusters.
6. There will be 4 debris collecting extrusions to increase the surface area and have maximum usage of the bot.
7. The debris upon entering the bot will be faced by a cushioning effect done by elastic dampening to reduce the force upon impact. It will then be stored in the body of the bot.
8. Damping materials reduces the force upon impact and dissipates the increased heat of the incoming debris. *Sorbothane* can be a potential material used in the interior of the bot.
9. 2 types of sensor technologies:
   - **LIDAR sensor:** for the location and size of debris
   - **Stabilisation sensor:** for the location and orientation of the bot

Slide 8 - Model Prototype [Ionel]

- "*Based on the presented ideas, here's the initial 3D rendition of the model that we've created.*"

Slide 9 - Product overview II [Agrima]

- *Now we continue...*

Slide 10 - Debris Analysis [Agrima]

- *Just to remind us:* - payload, small rocks/meteoroids
- Transport ⇒ laboratories
  – We need to observe if the material is interesting/valuable (by well-established techniques/practises),
  – if so, it is further preserved.

Slide 11 - Product overview III [Michal]

- *Hm, you might be wondering, what is the use of all such debris...*

Slide 12 - Debris re-use [Michal]

1. **Material recycling**
    1. Human payload = re-melting or other processes; for branches of industry
    2. Waste = mineral mining (metals: nickel, cobalt, iron, platinum, etc.)
2. **Sustainability aspect**
    1. Reduction of the space pollution
    2. Potential future risks and issues (that arise from space pollution) will be minimised in the early stage
3. **Scientific research**
    1. The obtained material can be provided amongst scientific institutions/foundations
    2. This way, new projects are supported
4. **BRACELET**
    1. An unique, one-to-one, bracelet can be bought
        1. Contains pieces of the materials obtained from space = *"Made in space"*.

Slide 13 - There's more [Michal]

1. A **video pitch** via `YouTube`
2. A **website** of the SDCR

Slide 14 - The Quote [Mariia]

- *We should not be scared of the space; instead we should to interact with it and integrate it in humankind as much as we can.*

Slide 15 - END [Mariia]

- *Tænk sjü.*