STIGMERGY FOR MULTI-ROBOT COVERAGE: DESIGN PRESENTATION

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PROJECT AIMS

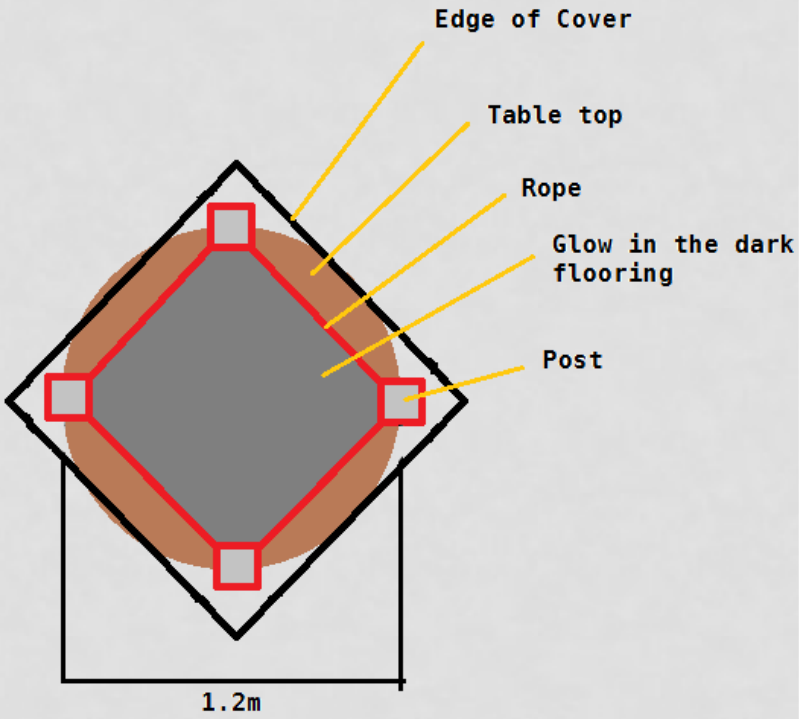
- Construct a Dark Room
  - Small enough to fit on a table approximately one meter in diameter
  - Quick to set up; Quick to dismantle
  - Uses glow in the dark foil as flooring
- Code a program to demonstrate the effectiveness of the Dark Room
  - Target System: e-Puck platform
  - Should interact with the glowing floor in some manner

RELATED RESEARCH

- Products of Research
  - StiCo: Ranjbar-Sahraei
  - BeePCo / HybaCo: Caliskanelli / Broecker
- Materials Research
  - Layering
  - Textured materials

COMPONENT: ARENA

- Portability
  - 4 Materials, not including table
  - Can fit in a Gym bag
- Flexibility
  - Posts define arena size, inner face
  - Rope adapts to posts

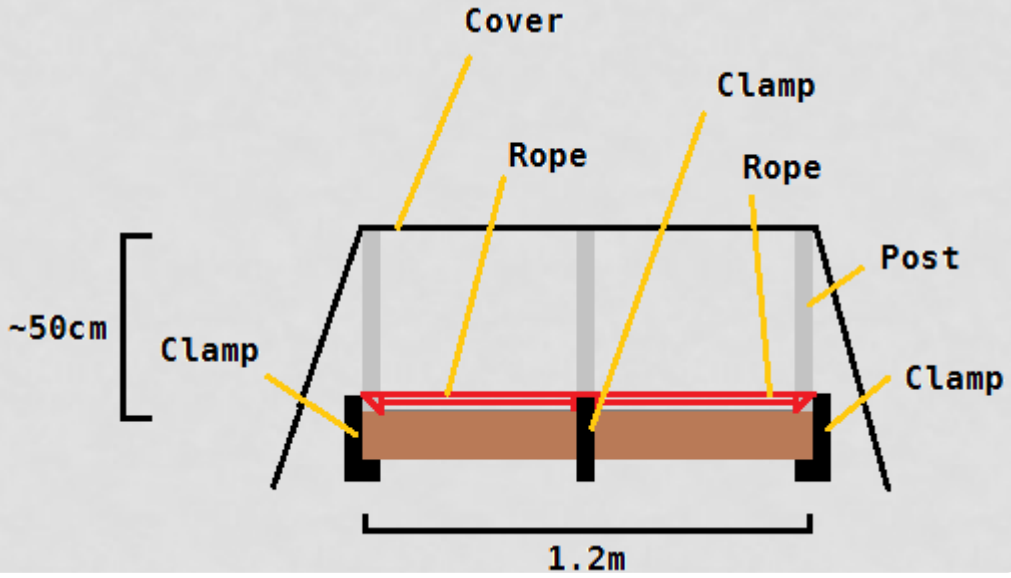


Algorithm 8 Rope Length Calculator (Measurements in centimetres)

1: $Edge = 3(\sqrt{2(r^2)}) + 2$ ▷ Multiplying by 3 is due to tripling the rope over
2: $WrappedPost = (postPerimeter \times 2) + 2$ ▷ Trailing 2's are for securing the rope
3: $TotalRequiredRope = 4(Edge + WrappedPost)$

COMPONENT: ARENA

- Rigidity
  - Clamps hold the posts in place; Rope can be pulled taut
  - Tripling the rope provides a firm enough barrier
    - Sheepshank, dogshank, rope shortening knots



COMPONENT: CODE

- StiCo
  - Basic Stigmergic algorithm
  - Fulfills Project aims
  - Two clear states – when pheromones are detected; when none are found

Algorithm 1 StiCo Algorithm[6]

Require: Each robot can deposit/detect pheromone trails

```
Initialise: Choose circling direction (CW/CCW)
loop
    while (no pheromone is detected) do
        Circle around
        deposit Pheromone
    end while
    if (interior sensor detects pheromone) then
        Reverse the circling direction
    else
        while (pheromone is detected) do
            Rotate
        end while
    end if
end loop
```

COMPONENT: CODE

- BeePCo / HybaCo
  - Extension if time permits
  - Use e-Puck's interface to decide which algorithm to run
  - Doubtful that range would be a problem in this project
    - Memory may be the deciding factor

EVALUATION: ARENA

- Can it house a multi-agent system?
- Can it hold robots without them leaving the area?
- Will it be dark enough to not affect the testing?
  - Will it be bright enough to effectively evaluate the robot?
- Is the setup complete within a reasonable time?

EVALUATION: ROBOT

- All the required functionality covered?
  - Interaction with localised light
  - Correct implementation of the Algorithm/s
- Will it be efficient enough?
  - Coding on a new platform takes time – refactor
- Any of the optional functionality covered?
  - Implementing a second algorithm to run alongside
  - Using HybaCo as a wrapper between StiCo/BeePCo

HUMAN DATA / PARTICIPANTS

- No Human data will be used during the implementation stage
- Human participants are unlikely
  - May be required later as a way to test run multiple robots together
  - Required steps will be taken should Human participants be implemented

CURRENT PROGRESS

- Looking for materials to build the Dark Room
  - Wood for posts; Metal for clamps etc.
- Revising C programming
  - Pointers
  - State Machines
  - Coding 'Standards'
- Learning how to implement e-Puck API
  - Stepping motions for the Motors
  - IR sensors
  - Network Connectivity (Bluetooth)

THANK YOU FOR YOUR TIME

ANY QUESTIONS?