README

This document explains how to run the Freeze Tag game both from source code and from a pre-built Docker image.
The project simulates a distributed Freeze Tag game using Python, LCM (Lightweight Communications and Marshalling), and OpenCV for visualization.

Multiple nodes interact over LCM:

- **GameNode** — Central controller, manages game state and visualization
- **ItNode** — The chaser node that tries to freeze other players
- **NotItNode** — Nodes that move randomly to avoid getting frozen

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Section 1: Running from Source Code

Project Structure

- `game.py` — Main entry point to start the game
- `game_node.py` — GameNode logic (controller + visualization)
- `it_node.py` — ItNode logic (chaser agent)
- `notit_node.py` — NotItNode logic (random moving agent)
- `node.py` — Base node class for shared functions
- `messages/` — LCM message definitions (Python bindings)
- `messages.lcm` — LCM message schema definitions
- `Dockerfile` — Docker image configuration
- `README.md` — This documentation

Requirements

- Python 3.8 or higher
- Install Python dependencies:
    - lcm
    - opencv-python
    - numpy

To install dependencies, run:

```
Unset
pip install lcm opencv-python numpy
```

Running the Game Locally

Once dependencies are installed, you can run the game using the below command. Ensure that the terminal is pointing to the directory where the file is located.

```
Unset
python3 game.py --width <width> --height <height> --num-not-it <count> --position <x1> <y1> <x2> <y2> ...
<it_x> <it_y>
```

Example command:

```
Unset
python3 game.py --width 20 --height 15 --num-not-it 3 --position 10 3 5 5 10 12 0 0
```

Explanation:

- `--width 20`: Grid width
- `--height 15`: Grid height
- `--num-not-it 3`: Number of NotIt nodes
- `–position 10 3 5 5 10 12`: Positions of NotIt nodes (x1 y1 x2 y2 ...)
- `0 0`: Position of the ItNode (x y)

To **exit** the game, press **Ctrl-C** in the terminal.

Section 2: Running from Docker Image (Ubuntu)

Step 1: Unpack the Docker Image

Open a terminal in the directory where the file `freeze-tag-game.tar`is located. Load the Docker image with:

```
Unset
sudo docker load -i freeze-tag-game.tar
```

To verify the image is loaded, check available images:

```
Unset
sudo docker images
```

You should see:

```
Unset
REPOSITORY          TAG       IMAGE ID       CREATED          SIZE
freeze-tag-game     latest    <image-id>     <timestamp>      <size>
```

Step 2: Allow Docker to Access Your Display (Linux Only)

Before running the container, allow Docker to access your host display:

```
Unset
xhost +local:docker
```

Step 3: Run the Docker Container

Use the following command to start the game. You can change the value of –width, –height, –num-not-it and –position args:

```
Unset
sudo docker run -it --rm \
--network=host \
-e DISPLAY=$DISPLAY \
-v /tmp/.X11-unix:/tmp/.X11-unix \
freeze-tag-game --width 20 --height 15 --num-not-it 3 --position 10 3 5 5 10 12 0 0
```

Note:

- `--network=host`: Ensures LCM communication works correctly between nodes
- `-e DISPLAY=$DISPLAY -v /tmp/.X11-unix:/tmp/.X11-unix`: Allows OpenCV GUI display from inside the container