Tracking Termites in a Crowded Environment

I. PROBLEM STATEMENT

Participants are tasked with developing an algorithm to effectively track termites in a "traffic jam" scenario, where each termite must be uniquely identified and tracked throughout a video. The participants will be given three training and one validation video of termites moving in a confined space; your code should assign a unique ID to each termite and accurately record its x and y coordinates at every frame. The performance of your code will be evaluated on similar videos – which will remain undisclosed to participants – to ensure that it is robust and generalizable. We will make the training and validation videos public to all participants; however, the judging videos will be kept private.

II. COMPETITION DETAILS

- participants are given one month to complete their submissions from the competition's start date: 11/20/2024
- the winning participant (or the team) will receive a cash prize of **1000 USD**
- by participating, entrants agree to submit their code for evaluation and potential use in subsequent research publications
- the winning code may be utilized in future studies or publications, with proper acknowledgment of the contributor in the form of a mention but without authorship rights in those publications

III. TRACKING OBJECTIVE

- each termite must be uniquely identified with a consistent ID throughout the video
- track and record each termite's x and y coordinates at every frame

IV. INPUT AND OUTPUT

- **Input**: a Github repository with Dropbox links to videos showing termites in a jammed or crowded environment – https://github.com/AtanuChatterjee/termites
- **Output 1**: a tracked video where individual termites are clearly segmented, with unique IDs visible for each termite
- **Output 2**: a structured dataset (e.g., CSV file) where each row represents a single frame, with columns for termite ID, x and y coordinates of each termite's center of mass and frame number

V. CODE REQUIREMENTS

- the algorithm should handle variability in termite size, shape, and movement speed
- it should be resilient to partial occlusions where termites overlap briefly
- the algorithm must handle situations where two termites cross paths, ensuring that each termite's unique ID is preserved and not confused with the other termite's ID before, during, and after the crossing

VI. JUDGING CRITERIA

1. Accuracy of Tracking (75%)
    - correctly maintaining termite IDs across frames
    - precise x and y coordinate tracking without significant drift or noise
    - ability to handle cases of overlapping termites without merging IDs
    - adaptability to different lighting, termite densities, and speeds in the testing videos
2. Efficiency (15%)
    - code should process each video within a reasonable time limit, reflecting optimized performance
3. Clarity and Documentation (10%)
    - well-documented code explaining key functions and processes
    - provide a clear explanation of the approach, handling of termite occlusion, and unique ID management

VII. SUBMISSION PROCESS

Participants are required to submit their entries by the competition deadline through the following steps:

- Create a GitHub repository for your project, containing all necessary files, including:
    - well-documented source code with clear explanations
    - a tracked video with segmented and labeled termites
    - a structured dataset in CSV format containg termite IDs, x and y coordinates, and frame numbers
    - a README file detailing your approach, dependencies, and instructions for running the code
- Once your repository is ready, send an email with the link to your GitHub repository to Atanu Chatterjee (achatterjee96@gatech.edu) and Saad Bhamla (saadb@gatech.edu) with the subject line "termite tracking challenge submission"

For any questions and queries participants may reach out to Atanu Chatterjee (achatterjee96@gatech.edu)