Project Vanguard
Software Development Team
ATLAS Integration Sub-Team

ATLAS Simulation Algorithm Software

Manuel E Portela-Colon

1. Proposal

1.1 Current Situation: Our objective is to build a system called ATLAS capable of tracking animals using their signal strength. The current situation is that we have an idea of the hardware the system will entail and the requirements that the system must have to complete its purpose. On the other hand, we do not have the specifics of how the algorithm must work to satisfy the requirements in mind.

1.2 Needs: We need to build an algorithm that is capable of simulating the behavior of our requirements, in other words, an algorithm that describes the logic behind our system and how it actually works and tracks the animal.

1.4 Solutions: The best solution we came up with is a simulation written in python that describes different modules and components in order to best describe the behavior of our system ATLAS. This algorithm takes into account probing and narrowing down the animal's location using the signal strength emitted from the animal.

2. Domain Description

2.1 Domain Entities

2.1.1 Animal: This entity focuses on simulating the animal that we are trying to track. For that reason, it generates fake coordinates as well as moves in a random manner. These coordinates are created inside a range based on the range of the drone. The animal is able to move randomly within a selected range as well in order to test that the drone can find a moving target.

2.1.2 DataPoint: Data Point is the entity used by the drone to collects and organizes the data. It is composed of the drone's location and the signal strength is found in that location.

2.1.3 Drone: The drone is the entity capable of moving and following the signal it uses different methodologies to dictate this movement in order to achieve its goal. In essence, the drone entity only knows its location and how to move in all directions.

2.1.4 Signal: Signal is the entity that the drone uses in order to understand the location emitted by the animal. It allows the drone to know if it is within a certain distance and if it is not he would not recognize the signal. In the case that it does, it provides a signal strength.

2.2 Domain Functions

2.2.1 move_Right: This function is used by the drone to move right or left depending on the value you enter.

2.2.2 move_Front: THis function is used by the drone to move front and back depending on the value you enter.

2.2.3 Calc_SS: This function is used by the entity signal to determine if the signal is in range and its strength if it is.

2.2.4 move_animal_location: THis function is used by the animal entity to randomly reallocate the animal within a certain range in order to simulate animal movement.

2.2.5 save_data: This function saves the animal location to a JSON file for it to be accessed at any time.

2.2.5 read_data: This function reads the last animal location reporter to the third party JSON file.

2.3 Domain Behaviors

2.3.1 Box Mission: This behavior describes the drone recollecting all nine points surrounding him and stores them in a list as DataPoints. This behavior uses functions such as move_Front, move_Right and Calc_SS. As well as entities such as Drone, DataPoint and Signal.

2.3.2 Move: This behavior describes the drone following the signal that it found by doing a Box Mission. For that reason, it uses the same functions and entities. Essentially the behavior involves determining the strongest signal recognized and moving the drone towards that direction, once it is not the strongest signal the behavior stops referring back to Box Mission.

2.3.3 Probe: This behavior is similar to the Box Mission with the difference that it does not store any data and it probes until the drone detects a signal within its range. It will then refer to the box mission in order to determine the direction of this signal.

2.3.4 Run: The run behavior decides when it is time to keep searching for the animal, narrow down its location, or if the animal has been found.

3. Algorithm Design

1--Probbing Mission-the drone moves in a square in a specific (range > 100m; range < 200m) and probes each point for a signal

2--Case1: The done finds a signal

> **2.1--Box Mission-**the drone moves in a box and collects the points seen in Figure 1 below.
>
> **2.2--**It determines the strongest signal between the nine measurements.
>
> **2.3--Case1:** It creates a directional vector t0->tx, tx: being the strongest signal in the box.
>
> > **2.3.1--**The drone will move in t0->tx direction as a scalar equal to the magnitude of t0->tx and collects signal strength measurements comparing them to the preview's location measurement.
> >
> > **2.3.2--Case1:** The current signal is the strongest and the drone keeps moving.
> >
> > **2.3.2--Case2:** The current signal is weaker, and the drone moves to the preview's location.
> >
> > **2.3.3--**The algorithm goes back to 1.
>
> **2.3--Case2:** t0 is the strongest signal and the algorithm stops and indicates that the animal is below inside a boxed raged relative to the box length chosen.

2--Case2: The drone does not find a signal within the range^2 and returns to home displaying no signal found while probing.