**Habib University**

**FALL 2019**

**CS 262 – Introduction to Computational Social Science**

**Project Submission 0: Project Specification (First Draft)**

**Names of Project Partners:**

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1. **Your project idea:**

Our project is a mapping of the effects of marine pollution in the Karachi sea. This will involve patterns of declining fish levels due to the waste and due to overfishing and also display the fishermen getting caught by India as they mistakenly cross borders while venturing into the deep sea. We are aiming to map two aspects of the problem of marine pollution: effects on fish as well as fishermen. Different kinds of fish experience this differently but waste disrupts their reproduction cycle and life spans. Secondly, the underprivileged strata of society, fishermen, have to suffer due to the practice of urban waste disposal at the sea. This project is necessary for Karachi where such practices are taking place in abundance and regulation is required. Our project can be used to potentially see the effects of certain regulations and their feasibility.

1. **Agents in the model:**
   1. **Agents Types:**

* **Fishes** (two types initially)
* **Waste Producers**: represent domestic waste collectors and industries which dump waste in sea.
* **Fishermen**
  1. **Nature of Agents:**

The agents in our model are **heterogeneous**.

* **Fishes**: Initially we want to present two different types of fish with varying life spans, reproduction cycles, and probabilities to die or get caught.
* **Waste Producers**: There are different types of waste producers which dump variety of waste in sea water. Industries produce chemical and plastic waste while households produce sewerage, plastics and other waste which is usually perishable.
* **Fishermen**: Fishermen will have different age, number of depending family members, fishing limit (how much fish is enough), status (whether working or caught at border) etc.

1. **Environment:**

Our environment is a combination of both social and geographical spaces. The water body (sea) is the most important geographical space while the interactions between fishes and waste, fishes and fishermen, and the fishes and fishermen among themselves make it a social environment.

1. **Interaction among agents:**

* The fishes interact with each other by flocking together.
* Fishes interact with waste by showing fear (going away) behavior and/or dying.
* The fishermen interact with fishes by modifying their fishing space as per the availability of fish. Less fish in the closer radius forces fishermen to go farther in sea to fulfil their requirement.

Environmental constraints on agents’ interactions include the following:

* The quality of (waste water or clean water) effects the actions of fishes.
* The water body is divided into deep and shallow (near the shore). Fishermen will just catch fishes in shallow water while in deep water, they have a probability to get caught or drown.

1. **Bounded Rationality:**

They act bounded rationally because the fishermen are not aware of the amount of fish in the entire sea and so they catch fish in the shallow area first. When they consider that area to be empty, they move towards deep seas and try searching for fish there.

They are also not aware of the distance that they have from the border and usually end up getting caught, while in pursuit of a good catch. Hence, they operate in a bounded rationally manner.

1. **Agents Learning from Interactions:**

The fish learns to stay close to other fish and away from the waste.

The fishermen learn how farther in sea they should go for fishing.

1. **Actions of Agents:**

* **Fishes:** fear or die if the neighbor patches are waste water (depends on the count of waste water patches in neighborhood), fishes also flock together with other fishes. Some of the fishes are caught by the fishermen as well. Fish reproduction.
* **Waste Producers:** Produce waste of different types, change color of water when it comes in contact with waste.
* **Fishermen:** Go in water, catch fish, if certain boundary is crossed then they get caught by forces too.

1. **Time:**

Waste is usually dumped in the sea in bulk on at least weekly basis. Fishermen do go fishing daily but it is really hard for them to face problems, like change in amount of fish or getting caught, on daily basis. Fishes also do not show the effect of waste within days.

**Weeks**, therefore, will give the most precise and efficient mapping of our simulation.

1. **[Optional] Outputs:**

We expect to observe the amount of waste that can be dumped in the body of sea which we are simulating. When it reaches an extremely high level, all of the fish will die, and we will observe at what level that happens.

We plan to observe following aspects of marine pollution through our model:

**Visually,**

* The water will change color if introduced with waste. The waste will also flow to neighboring patches.
* The fishes will show flocking and fear

**Using Plots,**

* We will observe the rates of fish production, deaths and fishing.
* We will also observe the rate of risk (death, prison) for the fishermen.
* We are also planning to introduce marine pollution related policies to our model and observe the impacts on our base observation attributes.