General loop for BDI model:

We distinguish two main phases in the simulation:

1. Explore the environment (find depots and the shoreline);
2. Build the embankment along the shoreline;

Initialize BDI

We assume that the first desire is to “explore the world”.

* Beliefs:
  + Global beliefs initially given to all agents:
    - # of depots in the environment;
    - # of patches that make up the shoreline;
    - # number of agents in environment;
    - Direction of the shoreline, in our case (currently) always a vertical direction (this knowledge can be used when exploring the shoreline) and “we know” that the “sea” is in the East of our world (which should be also referred to as global knowledge);
  + Location of depots: empty list;
  + Patches that make up the shoreline: empty list.

Note: It would be helpful to sort the patches based on their y-coordinate because we belief that the shoreline has a vertical direction (that’s how we implemented is currently). Sorting it on y-coordinate will make a meaning ordering that can be used for exploration and construction.

* + # of agents at the shoreline. We could use this information to possibly optimize the exploration or the start of the building process, because you could imagine that it is not optimal that they are all heading to the shoreline, if some of them found pieces they can probably explore the rest of the shoreline quite efficiently. We could use a certain threshold, if more than 6 agents are already exploring the shoreline “do something else”. E.g. search for depots. If the location of all depots is already found, then go to one of them (in your neighborhood) and wait there until the complete shoreline is explored. We can then experiment with the “threshold” for example and see what is optimal.

* Desires:
  + “Explore the world”
* Intentions:
  + “explore randomly”

Note, because agents will communicate with each other via different types of messages, each of them will have (for know I will assume that they will be all separate objects, but possibly we can find a way to find a more generic implementation where we have one queue and the message has a “header/type”, for me that has low priority):

* A message queue (list) to communicate the locations of the shoreline;
* A message queue to communicate the locations of the depots:
* An idea for later: for optimization purposes it could be an idea that an agent sends a message where its current location at the shoreline is (for those that are there, having found a piece). This information could be used a) to determine whether it is still suitable to go in the direction of the shoreline for exploration or “do something else”. Low priority.

While the whole shoreline is not fully explored or not all depots have been located

* Perceive:
  + Use your vision radius and look for:
    - Water
    - Depots
* Update your beliefs:
  + Note, if you look at “other” BDI models, they always have the sequence of “first perceive and then update your beliefs”. We did not do that in our previous implementations but I think it makes more sense this way.
  + If shoreline is not complete: update beliefs about location of shoreline:
    - Because “we know” that the shoreline has a vertical direction, we can always deduce that the patch “to the left of the observed water patch” must be a “shoreline patch”.
    - If that patch is not already part of your beliefs, add it to your beliefs.
  + If not all depots already located: update beliefs about location of depots:
    - If location not yet part of the beliefs about depot locations then add to beliefs;
  + Check your message queues for new information and update your beliefs based on that information;
* Communicate new beliefs:
  + If the agent has discovered new beliefs (e.g. about the location of a depot) share that information with the rest of the agents by sending a message (see above for the different message objects);
* Update desires
  + As long as both locations (depots, shoreline) are not fully explored equal to “explore the world”.
* Update intentions
  + No pieces of shoreline have been explored, intention = randomly explore world;
  + If not all pieces of shoreline have been explored
    - For later, if we know how many agents are currently “somewhere along the shoreline” because they discovered “a piece” than we could implement a threshold saying “search for depots” or if all depots have been found “go to one of the depots and wait there until the others have found all pieces of shoreline”, this would be a kind of preparation step for the “construction fase;
    - If not at the shoreline (I found a piece and looking for the next one, because this is a different intention, see below) and “shoreline explored NOT complete”, go east and choose a north/south direction (y-coordinate) of a y-coordinate that is not already explored (to start with agent should choose the y-direction that is closest to its current position;
  + If all pieces of shoreline have been explored but not all depots:
    - Randomly explore environment;
* Execute actions