

# ES 2: Critical thinking with Python

aka, Introduction to Computing for Engineers

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**On current events...**

# The roomba problem

It's 2005 or so, and you're designing the "navigation" algorithm for a vacuum-cleaner robot.

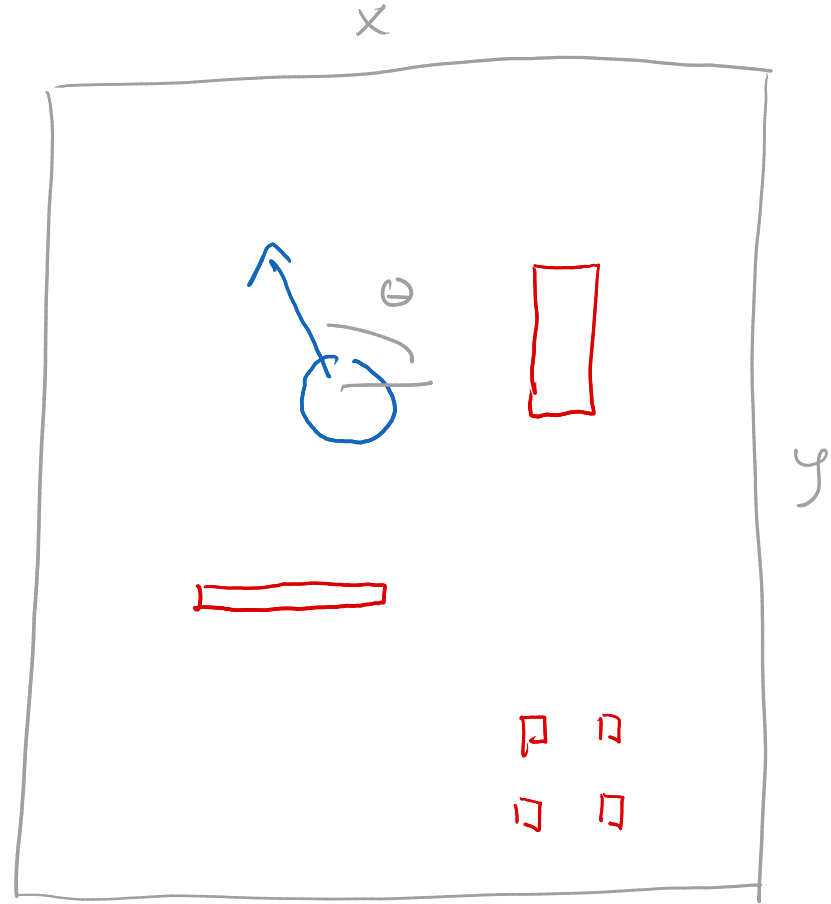
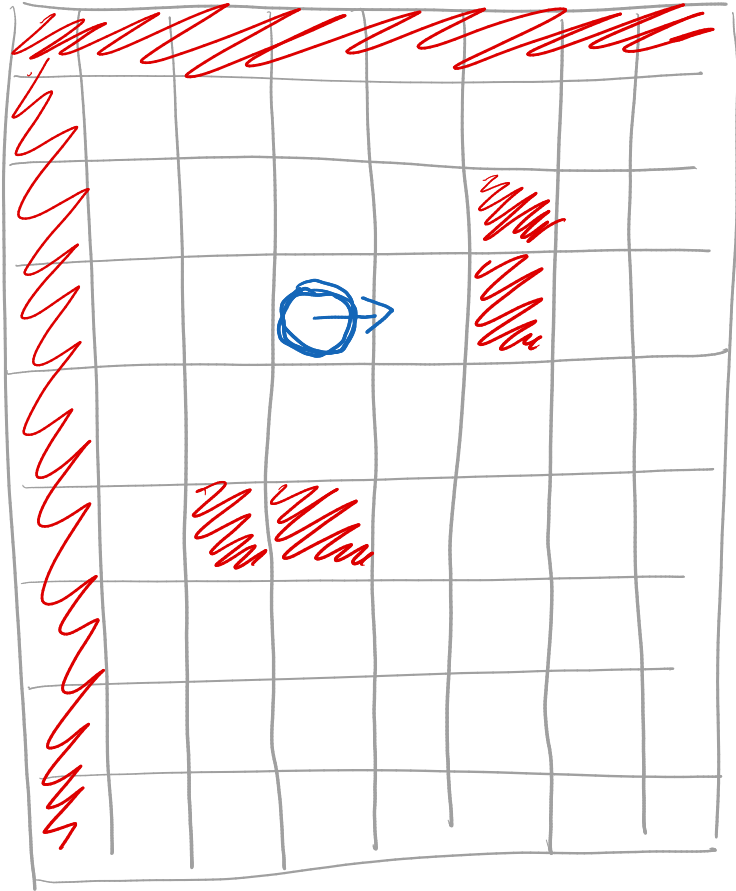
You want to build a simulation that will let you try different algorithms and evaluate how effectively they cover the room.

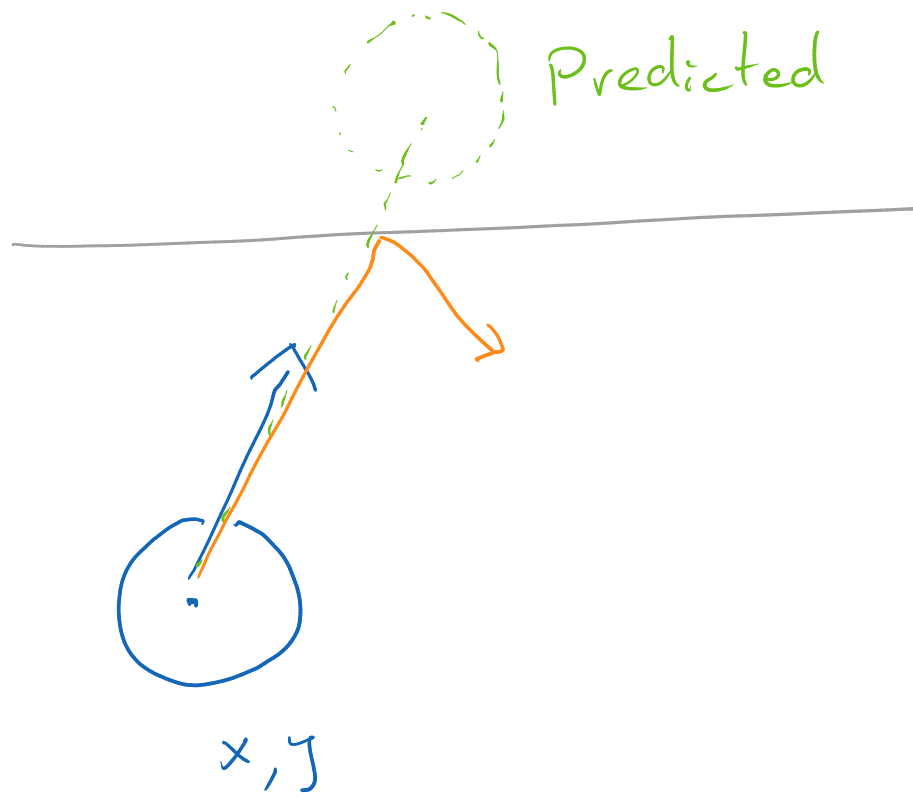
# Breaking down the roomba problem

Objective: given a roomba navigation algorithm and a simulated room, calculate the coverage as a function of time.

## **1) What sub-problems do you need to solve?**

On your Google docs slide, write down as many as you can.





Option 1

Option 2: use a smaller time step

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Objective: given a roomba navigation algorithm and a simulated room, calculate the coverage as a function of time.

## **1) What sub-problems do you need to solve?**

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## **2) How can you solve and test one of these?**

## **3) What is the simplest version of the problem that you could start with?**

**A starting point**



# **A soapbox: iterating fast > perfect planning**

If you're working on an interesting problem, you almost certainly don't know everything.

Therefore, instead of making a perfect plan, get something basic working ASAP and then iterate.

# One example of iteration



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## **Side note: random numbers**

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Computers generally don't have truly random numbers  
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`np.random.seed()`      Start the random number generator  
in a known state

`np.random.randint()`