

Title: Spike Project Week 2**Author:** Tran Duc Anh Dang | 103995439**Goals / deliverables:**

A Spike is an agile software engineering practice used to overcome some gap in knowledge or skills. In these cases, it is difficult to build a plan or design in which you can have much confidence. The aim of the spike is to overcome these issues as quickly as possible.

Technologies, Tools, and Resources used:

List of information needed by someone trying to reproduce this work

- Python 3+
- Built in Python libraries.
- IDE or Code Editor (Visual Studio Code)

Tasks undertaken:

- Install Python: Download and Install Python 3+ via <https://www.python.org/downloads/>
- Set up a code editor or IDE: Download and install a python compatible ide or code editor such as Visual Studio Code, PyCharm
- Open and familiarize with the code by reading through, paying attention to the comments that had been made.
- Run the code: Execute the code and observing the output.

What we found out:

Here is the output of the simple version of the code provided:

```
ACTIONS:
* [get raw food]: {'Eat': -3}
* [get snack]: {'Eat': -2}
* [sleep in bed]: {'Sleep': -4}
* [sleep on sofa]: {'Sleep': -2}
ACTIONS:
* [get raw food]: {'Eat': -3}
* [get snack]: {'Eat': -2}
* [sleep in bed]: {'Sleep': -4}
* [sleep on sofa]: {'Sleep': -2}
>> Start <<
-----
GOALS: {'Eat': 4, 'Sleep': 3}
BEST_GOAL: Eat 4
BEST ACTION: get raw food
NEW GOALS: {'Eat': 1, 'Sleep': 3}
-----
GOALS: {'Eat': 1, 'Sleep': 3}
BEST_GOAL: Sleep 3
BEST ACTION: sleep in bed
```

```
NEW GOALS: {'Eat': 1, 'Sleep': 0}
```

```
-----  
GOALS: {'Eat': 1, 'Sleep': 0}
```

```
BEST_GOAL: Eat 1
```

```
BEST ACTION: get raw food
```

```
NEW GOALS: {'Eat': 0, 'Sleep': 0}
```

```
-----  
>> Done! <<
```

Here is the output of the complex version of the code provided:

```
ACTIONS:
```

```
* [get raw food]: {'Hunger': -30}  
* [eat food]: {'Hunger': -10, 'Energy': 10}  
* [sleep]: {'Energy': 50, 'Happiness': 30}  
* [watch movie]: {'Energy': -50, 'Happiness': 10}  
* [hang out with friends]: {'Energy': -50, 'Happiness': 10}  
* [exercise]: {'Energy': -50, 'Happiness': -50}
```

```
ACTIONS:
```

```
* [get raw food]: {'Hunger': -30}  
* [eat food]: {'Hunger': -10, 'Energy': 10}  
* [sleep]: {'Energy': 50, 'Happiness': 30}  
* [watch movie]: {'Energy': -50, 'Happiness': 10}  
* [hang out with friends]: {'Energy': -50, 'Happiness': 10}  
* [exercise]: {'Energy': -50, 'Happiness': -50}
```

```
>> Start <<
```

```
-----  
GOALS: {'Hunger': 100, 'Energy': 100, 'Happiness': 100}
```

```
BEST_GOAL: Hunger 100
```

```
BEST ACTION: get raw food
```

```
NEW GOALS: {'Hunger': 70, 'Energy': 100, 'Happiness': 100}
```

```
-----  
GOALS: {'Hunger': 70, 'Energy': 100, 'Happiness': 100}
```

```
BEST_GOAL: Energy 100
```

```
BEST ACTION: exercise
```

```
NEW GOALS: {'Hunger': 70, 'Energy': 50, 'Happiness': 50}
```

```
-----  
GOALS: {'Hunger': 70, 'Energy': 50, 'Happiness': 50}
```

```
BEST_GOAL: Hunger 70
```

```
BEST ACTION: get raw food
```

```
NEW GOALS: {'Hunger': 40, 'Energy': 50, 'Happiness': 50}
```

```
-----  
GOALS: {'Hunger': 40, 'Energy': 50, 'Happiness': 50}
```

```
BEST_GOAL: Energy 50
```

```
BEST ACTION: hang out with friends
```

```
NEW GOALS: {'Hunger': 40, 'Energy': 0, 'Happiness': 60}
```

```
-----  
GOALS: {'Hunger': 40, 'Energy': 0, 'Happiness': 60}
```

```
BEST_GOAL: Happiness 60
```

```
BEST ACTION: exercise
```

```
NEW GOALS: {'Hunger': 40, 'Energy': 0, 'Happiness': 10}
```

```
GOALS: {'Hunger': 40, 'Energy': 0, 'Happiness': 10}
BEST_GOAL: Hunger 40
BEST ACTION: get raw food
NEW GOALS: {'Hunger': 10, 'Energy': 0, 'Happiness': 10}
-----
GOALS: {'Hunger': 10, 'Energy': 0, 'Happiness': 10}
BEST_GOAL: Hunger 10
BEST ACTION: eat food
NEW GOALS: {'Hunger': 0, 'Energy': 10, 'Happiness': 10}
-----
GOALS: {'Hunger': 0, 'Energy': 10, 'Happiness': 10}
BEST_GOAL: Energy 10
BEST ACTION: watch movie
NEW GOALS: {'Hunger': 0, 'Energy': 0, 'Happiness': 20}
-----
GOALS: {'Hunger': 0, 'Energy': 0, 'Happiness': 20}
BEST_GOAL: Happiness 20
BEST ACTION: watch movie
NEW GOALS: {'Hunger': 0, 'Energy': 0, 'Happiness': 30}
-----
GOALS: {'Hunger': 0, 'Energy': 0, 'Happiness': 30}
BEST_GOAL: Happiness 30
BEST ACTION: watch movie
NEW GOALS: {'Hunger': 0, 'Energy': 0, 'Happiness': 40}
-----
GOALS: {'Hunger': 0, 'Energy': 0, 'Happiness': 40}
BEST_GOAL: Happiness 40
BEST ACTION: watch movie
NEW GOALS: {'Hunger': 0, 'Energy': 0, 'Happiness': 50}
-----
GOALS: {'Hunger': 0, 'Energy': 0, 'Happiness': 50}
BEST_GOAL: Happiness 50
BEST ACTION: exercise
NEW GOALS: {'Hunger': 0, 'Energy': 0, 'Happiness': 0}
-----
>> Done! <<
```

The difference between those are action_utility functions. Where in complex version includes an extension that accounts for additional factors such as side effects of action on other goals as well as the probability of the action being successful and constraints on goal values.

In simple version:

1. It's a standalone function that calculates the utility for an action based on the change in the specified goal.
2. The utility is simply the change to the specified goal.
3. It checks if the goal is affected by the action, and if not, returns a utility of 0.

Where in the more complex one:

1. It starts with the same utility calculation as the first function.
2. It includes an extension that adds extra functionality to the utility calculation:
 - It iterates overall goal changes for the action and updates the goals accordingly.
 - It checks for the success probability of the action and adjusts the utility accordingly.
 - It considers the positive utility actions and multiplies the utility by 2 if the new goal value is greater than or equal to 0. If the new goal value is greater than 100, it sets the utility to 0.

Overall, in the simple version, it is providing a simpler utility calculation for a specific goal while complex version extends the utility calculation by considering side effects on other goals, success probability and constraints on goal values.