<div style="border:1px solid">

Repeatability package

For Paper "On Robust Controlled Invariants for Continuous-time Monotone Systems "

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1 Introduction

This directory contains code to recreate Figure 2 and Figure 3 from the paper "On Robust Controlled Invariants for Continuous-time Monotone Systems " (Emmanuel Junior Wafo Wembe et Adnane Saoud) in ADHS.

2 Installation Instruction

The code was written in Python 3.8. The code may also work for Python 3.6 or later. To install Python you may:

- Recommended: install Anaconda Python 3.x distribution

- Alternative: install Miniconda Python 3.x distribution.

Then, open a terminal (or an "anaconda prompt") and enter the directory of this repeatability package. install dependency with:

```
conda env create −f environment.yml
```

Optional: install a code editor as:

- Vscode

- PyCharm Community Edition

Activate the environment with the command:

```
conda activate controlled_invariant
```

3 Code details

1. (a) "two_tanks_problem_lower_closed_1cm.py" generates figure 2

   (b) "two_tanks_problem_lower_closed_0.5cm.py" generates figure 3

2. in the "Utils" folder

   - "utils.py": Helper function to generate random step of piecewise affine function with either uniform discretisation or random discretisation step.
   - "solving_equation.py": A bunch of simple implementations of numerical methods for solving ode.
   - "Lower_closedset.py": Set of functions used to define the lower closure or the upper closure of the trajectory of a piecewise linear function.
   - "invariant.py": helper function to compute invariant for a problem with state space of dimension 2 $X \subseteq \mathbb{R}^2$
   - "feasibility.py": helper function for checking the feasibility of single trajectory
   - "Computing_invariant_n_dim.py" An extension of the code in "invariant.py" to handle more dimensions for the state space

4 Runing python files

In Vscode, install the python extension in the marketplace as shown in this figure: Open this folder
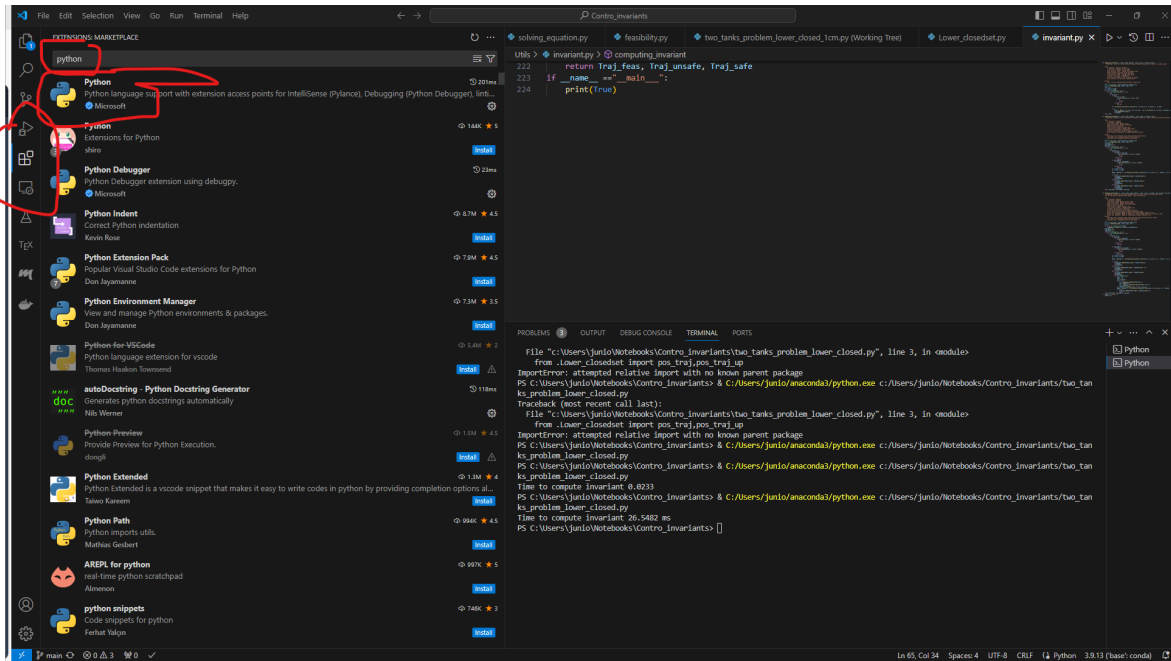

Figure 1: installing python in Vscode

in Vscode and follow steps described here to select the interpreter with "controlled_invariant". And then click on the play button to run the script. Only "two_tanks_problem_lower_closed_xcm.py"files will run. Other will throws an error.
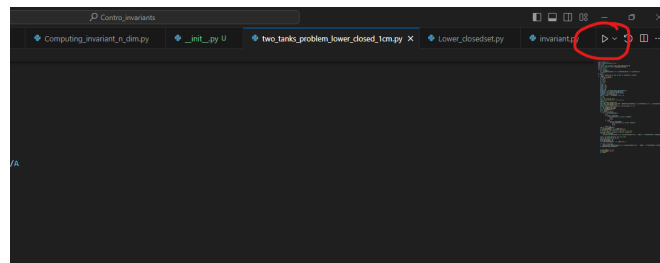

Figure 2: Enter Caption