vPlanSim: An Open Source Graphical Interface for the Visualisation and Simulation of AI Systems

Jamie O. Roberts, Georgios Mastorakis, Brad Lazaruk, Santiago Franco, Adam A. Stokes, Sara Bernardini

Motivation

As the fields of Task Planning progress, the problems that they try to solve become increasingly more complex. The difficulty in interpreting and comprehending the information of the initial state and plan output will increase accordingly. These complexities are even more acute when dealing with a 3-D problems and environments. It is difficult to communicate and convey the nature of 3D problems and the interaction of systems within the 3D environments, without a common platform that is understandable.

We present vPlanSim: An Open Source Graphical Interface for the Visualisation of PDDL problems. This software is widely accessible to most programming literate users, with minimal dependencies.
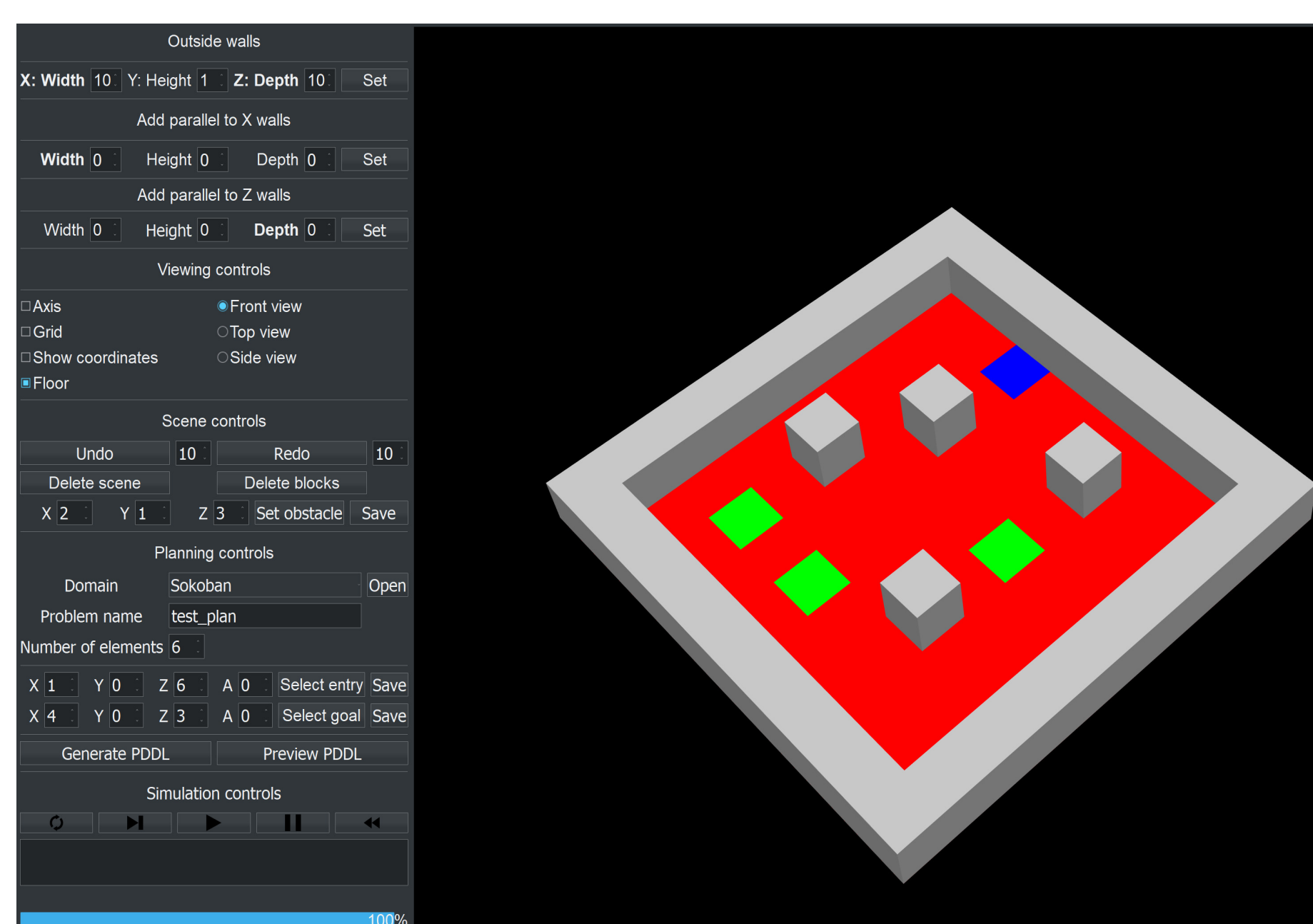
Features

- 3D: Open source dependencies, written in Python3.

- Interaction with domain predicates via graphical interface.

- Graphically create and generate domain specific problem files in PDDL.

- Visualisation of output plans in original environments.

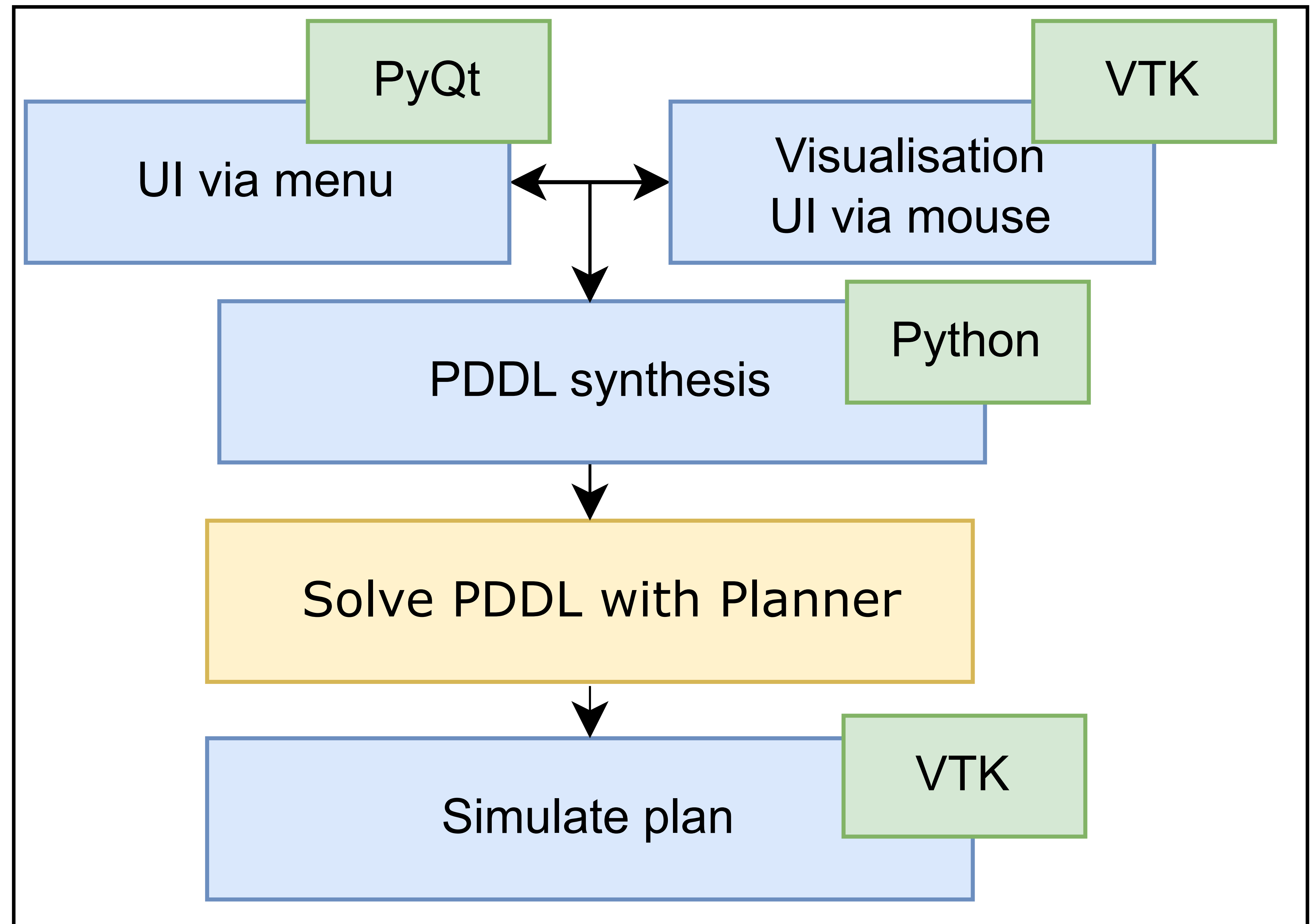- Accessible for user modifications and additions.

Visualisation

The visualisation functionalities are built entirely on the open-source library VTK. Users can utilise their own graphics in many forms, from .STL files to bespoke 3D representations.

These visualisation can be used in the problem generation section or in the plan visualisation section. For plan visualisations, the user can modify the pre-defined functions which handle Plan Interpretation, Graphic allocation to agents and Plan Execution. This well-defined pipeline handles the visualisation of generated plans and is easily modifiable to fit the users specific needs and domain representation.
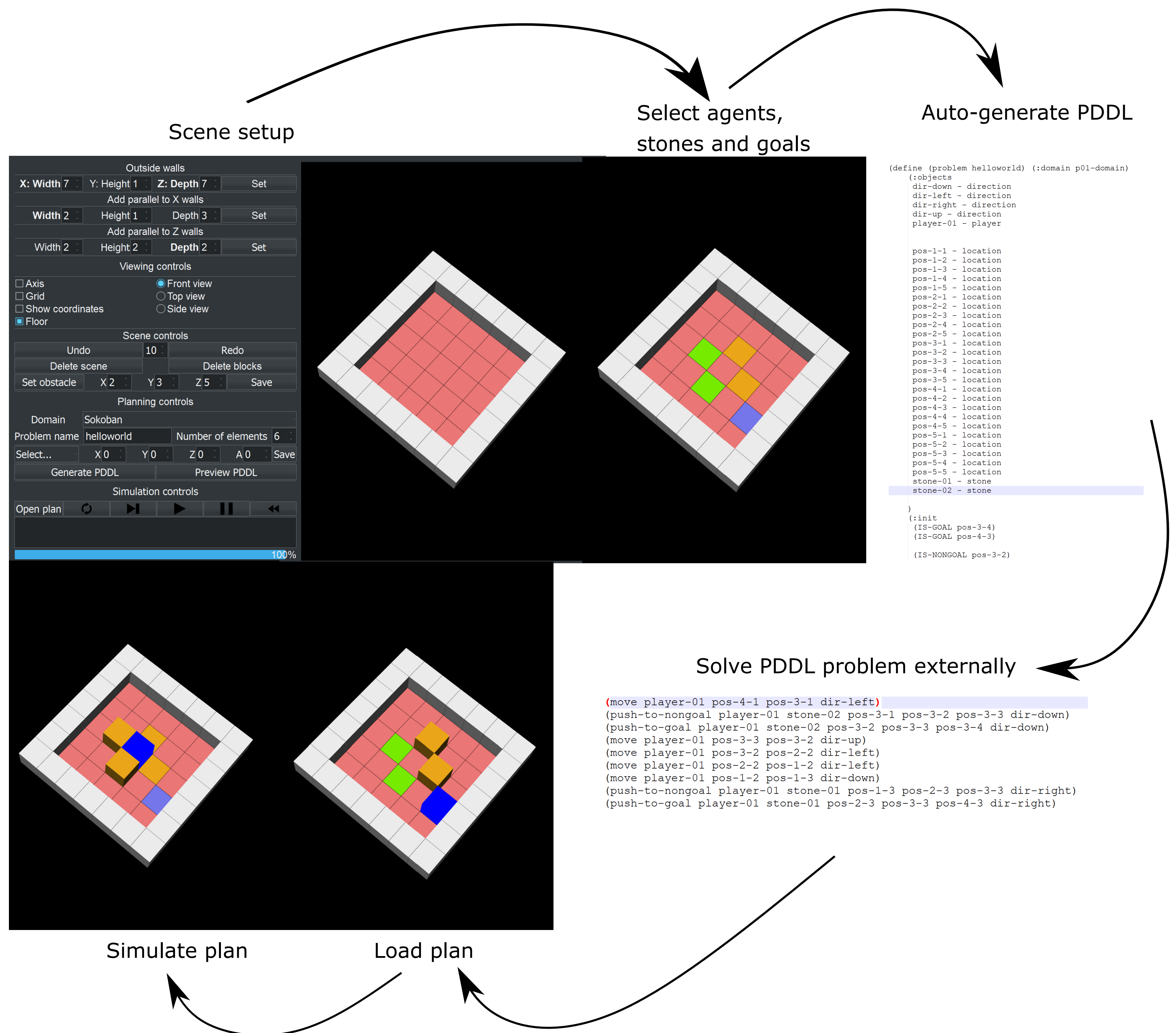
This work is presented, and is available, with two domain examples in Sokoban and a bespoke Drone domain. The differences in these pipelines demonstrate the flexibility between using .STL files or VTK generated graphical units to represent the agents in the domain.

Program Pipeline

Example Usage

Scene setup — Select agents, stones and goals — Auto-generate PDDL

Solve PDDL problem externally

Simulate plan — Load plan

Conclusions

- We have introduced and demonstrated vPlanSim, a lightweight and open source software package for Task Planning researchers to quickly and easily visualise their systems for the purposes of communication and development.

- vPlanSim does not contain any physics as standard but is instead meant as a quick and effective visualiser.

- vPlanSim allows the user to construct a 3D representation to aid them in developing their systems by visually generating problem files and simulating their plans in the same environment.