Instructions for Repeatability Evaluation

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This documents contains the instructions to repeat and test the results present in the paper entitled "From Uncertainty Data to Robust Policies for Temporal Logic Planning". More specifically, the folders '/CaseStudy1' and '/CaseStudy2' contain the files and functions needed to reproduce both the case studies 5.1 and 5.2.

1 Installations required

All the script and functions rely on a recent installation of MATLAB. Moreover, to solve optimization problems YALMIP ought to be installed, together with *one of the two* solvers: CPLEX, GUROBI. For installation instructions see:

- YALMIP : `https://yalmip.github.io/tutorial/installation/`

- CPLEX : `https://www.ibm.com/support/knowledgecenter/en/SSSA5P_12.7.1/ilog.odms.cplex.help/CPLEX/MATLAB/topics/gs_install.html`

- GUROBI : `http://www.gurobi.com/documentation/6.5/quickstart_mac/software_installation_guid.html`.

We used MATLAB 2016a/b, YALMIP R20160930 and CPLEX 12.7.1 on a Windows 7 computer with 8GB of RAM and a processor Intel Core i5 with 2.8 GHz. It has also been tested on a similar machine running Ubuntu 16.04 LTS.

For both the case studies, different levels of reproducibility can be selected. Namely, the user can decide to solve the optimization problems using CPLEX or GUROBI but can also decide to directly load the precomputed optimal solutions. In the latter case, no installation of YALMIP, CPLEX, and GUROBI is required.

2 Case Study 5.1 - Avoiding a turning truck

To reproduce the case study navigate to the folder '/CaseStudy1' and run the main script `Main_Script.m` in the folder (for instance typing `run(Main_Script.m)` in the MATLAB command window). Different 'depths' of repeatability can be selected for this case study. Namely, the user can decide to load all the optimizers (with a total duration of few minutes), solve only one instance of the scenario program (taking roughly 1 hour), or solve all the 15 instances of the scenario programs (taking roughly 15 hours). For each of these cases, the user can decide whether to evaluate the found policies over the realizations of the uncertainties used in the paper or over new realizations.

While the script is running, the user should interact with it through the MATLAB command window where a total of 5 decisions are requested to achieve the different degrees of repeatability mentioned above. The fastest way to reproduce the exact results in the paper is to always select option 1.

Figure 1), Figure 2.a) and Figure 2.b) will be plotted throughout the process and saved in the folder 'CaseStudy1/Figures' (initially empty). To zoom and re-size the figures we recommend to wait the for the run to end. MATLAB 2016a, for instance, does not allow to interact with the figures while the script is running. The saved Figure 2.a) can be opened only in MATLAB 2014b or later releases since it will be saved as a 'compact' `.fig` file.

3 Case Study 5.2 - Safe overtake

To reproduce the case study navigate to the folder '/CaseStudy2' and run the main script `Main_Script.m` (for instance typing `run(Main_Script.m)` in the MATLAB command window). The repeatability process of this case study has an approximate duration of a few minutes, but depends on the degree of repeatability chosen by the user. Firstly, the user can decide to load the estimate of the support set used in the paper or obtain it solving the related scenario program. Secondly, the user can decide to load the optimal policies for number of partition elements $P = 1, 2, 3, 5, 9$, or obtain them by solving the robust program up to an arbitrary number $P = P_{max}$ of elements. As in Case Study 5.1, the user can decide to evaluate the policies over the realizations of the uncertainty used in the paper or over new realizations.

While the script is running, the user should interact with it through the MATLAB command window where a total of 7 decisions are requested to achieve the different degrees of repeatability mentioned above. The fastest way to reproduce the exact results in the paper is to always select option 1.

Figure 3), Figure 4.a), Figure 4.b), and Figure 5) will be plotted throughout the process and saved in the folder 'CaseStudy2/Figures' (initially empty). To zoom and re-size the figures we recommend to wait for the run to end. MATLAB 2016a, for instance, does not allow to interact with the figures while the script is running. The saved Figure 4.b) can be opened only in MATLAB 2014b or later releases since it will be saved as a 'compact' `.fig` file.