**Feasibility study on the use of reinforcement learning for automated CubeSat concept generation**

B. Krijnen*1\*; J. Guo1*

*1Faculty of Aerospace Engineering, Delft University of Technology, Delft, Netherlands, \*Primary author contact details:* *B.Krijnen@student.tudelft.nl*

The growing need for CubeSats for various space missions could present strong demands for the use of automated systems during the early stage of the design cycle. An ever-increasing catalogue of commercial-off-the-shelf (COTS) components for CubeSats creates an increasing amount of design options for the generation of concepts. Manual design methods make only limited use of this available design space because they rely on the engineer’s input for design choices and are therefore constrained by the engineer’s knowledge and experience. Automated systems that are able to incorporate the entire design space may potentially improve the design of a CubeSat, compared to manual methods. Artificial Intelligence (AI) could provide a solution for automated systems for the generation of concepts based on the entire catalogue of COTS components. In this paper, the performance of a design tool that makes use of reinforcement learning (RL) for automated CubeSat concept generation is presented. The design tool that is created is able to generate CubeSat concepts using a RL algorithm which is able to select subsystem components from a hypothetical hardware database, thereby generating a complete CubeSat concept. The final performance of generated concepts is evaluated using a reward system that provides rewards based on subsystem and system performance against user entered requirements, thereby keeping the engineer in the loop. The appeal of using RL to identify feasible concepts for user requirements is that knowledge from earlier runs can be re-used to provide faster results for new missions. The RL-based approach is first applied to a low complexity problem, after which the complexity of the experiments is gradually increased ending up with the complete generation of a CubeSat concept. The effect of this increase in complexity on the performance of the design tool is presented in this paper. From these results, benefits and drawbacks of using RL for the generation of CubeSat concepts are presented. Through this investigation, it is shown whether such a RL-based approach for the generation of CubeSat concepts shows promise for further research or development efforts for increasing the capabilities of the design tool.