

Using Generative AI to generate action plans for autonomous systems.

Contacts

Damien Pellier (Damien.Pellier@imag.fr) LIG-Marvin
Humbert Fiorino (Humbert.Fiorino@imag.fr) LIG-Marvin,

Keywords

Automated planning, Generative AI

Context

Automated planning [1] is a field of the Artificial Intelligence whose purpose is to devise decision algorithms for autonomous systems i.e., agents such as robots, drones, bots etc. As these systems act without human supervision, that is “autonomously”, they have to generate plans of actions at all times in order to achieve the goals that have been assigned to them. Autonomous planning is known to be NP-hard and Domain-Specific Languages (DSL) like PDDL (Planning Domain Description Language) [2] have been designed to model/specify agent missions (the actions, goals and world states etc.) as planning problems. Plan generation is based on a number of classic AI techniques, such as tree search and heuristic search, SAT or CSP problem solving, etc. (see [PDDL4J](#) [3] and [1] for more details).

At the same time, generative artificial intelligence (also generative AI or GenAI [4]) is artificial intelligence capable of generating text, images, or other media, using generative models [5][6][7]. Generative AI models learn the patterns and structure of their input training data and then generate new data that has similar characteristics.

In the early 2020s, advances in transformer-based deep neural networks enabled a number of generative AI systems notable for accepting natural language prompts as input. These include large language model chatbots such as ChatGPT, Bing Chat, Bard, and LLaMA, and text-to-image artificial intelligence art systems such as Stable Diffusion, Midjourney, and DALL-E.

Objective

The aim of this internship is to study how generative AI techniques can be used to generate action plans for autonomous agents. The aim will be to gain a good understanding of the two domains in order to propose a resolution method for planning using generative AI techniques.

References

- [1] M. Ghallab, D. Nau and P. Traverso, “Automated Planning”, Morgan-Kaufman, 2004.
- [2] M. Fox, D. Long, “PDDL2.1: An Extension to PDDL for Expressing Temporal Planning Domains”, J. Artif. Intell. Res. 20: 61-124, 2003.
- [3] D. Pellier, H. Fiorino, “PDDL4J: A Planning Domain Description Library for Java”, Journal of Experimental & Theoretical Artificial Intelligence, pages 143-176, volume 30(1), 2018.
- [4] Newsom, Gavin; Weber, Shirley N. (September 6, 2023). "Executive Order N-12-23" (PDF). Executive Department, State of California. Retrieved September 7, 2023.
- [5] Jump up to:a b Griffith, Erin; Metz, Cade (2023-01-27). "Anthropic Said to Be Closing In on \$300 Million in New A.I. Funding". The New York Times. Retrieved 2023-03-14.
- [6] Lanxon, Nate; Bass, Dina; Davalos, Jackie (March 10, 2023). "A Cheat Sheet to AI Buzzwords and Their Meanings". Bloomberg News. Retrieved March 14, 2023.
- [7] Pinaya, Walter H. L.; Graham, Mark S.; Kerfoot, Eric; Tudosi, Petru-Daniel; Dafflon, Jessica; Fernandez, Virginia; Sanchez, Pedro; Wolleb, Julia; da Costa, Pedro F.; Patel, Ashay (2023). "Generative AI for Medical Imaging: extending the MONAI Framework". arXiv:2307.15208.