Thanks Flavie, to make the transition to the article.

… So, the article "Humanoid Path Planning for Rough Terrain Navigation" presents a trajectory planning approach for humanoid robots to navigate in difficult environments. This approach combines a path planner with a balance controller and step planner to allow a robot-like Atlas to move through challenging terrain in a fluid and natural way.

… The path planner uses the A* algorithm (based on Dijkstra algorithm) to find an optimal trajectory through difficult terrain while minimizing effort costs and maximizing stability. To do this, the planner uses a height map that represents the terrain and calculates contour costs to avoid hard-to-cross areas, as well as effort costs to minimize the amount of energy required for movement. These costs are weighted to prioritize the stability and safety of the robot.

… The IHMC balance controller and step planner are then used to track the path calculated by the path planner. The step planner uses a map of flat regions to determine the best fulcrum points for each step of the robot. This map is generated from a high-resolution point cloud captured by a LIDAR sensor. The step planner then uses the A* algorithm to find the best step sequence to follow the path of the path planner.

… As you can see on the board, we have different article pictures. On the left, we have the LIDAR point cloud, which will be treated to generate the ground and the different volumes of the environment. And on the right the different trajectories generated by the algorithm in specific cases.

So, we can note that the robot will not try to jump over the stairs (as in example A and C) or to step over an obstacle (as in example B), because it would be too expensive in energy. Instead, he uses the environment has its advantage, as shown in example D.

… The proposed approach was tested on the Atlas robot using a variety of challenging terrains. The results show that the proposed path planning allows the robot to move through rough terrain in a fluid and natural way. However, it should be noted that the A* algorithm can sometimes encounter "dead end" problems, where the planner spends a lot of time looking for a trajectory towards the goal in a direction that proves impossible. The authors suggest using a series of simplified metrics to improve the heuristics of the A* algorithm and speed up trajectory planning.

… To conclude, the article trajectory planning approach represents a significant advance in the field of challenging terrain robotic navigation. The results obtained on the Atlas robot demonstrate the approach feasibility and suggest research avenues to improve trajectory planning in risky terrain.

… To presentation end and show the approach results, I will let you watch of this short 2min video, which quickly presents the Altas features pushed by this navigation algorithm.

(Video)

Thank you for listening. Do you have any questions?