TopoPlan is a toolkit dedicated to the analysis of a 3D environment geometry in order to generate suitable data structures for path finding and navigation. This toolkit provides a two step process: an off-line computation of spatial representation and a library providing on-line processes dedicated to path planning, environmental requests, navigation...

TopoPlan is based on an exact 3D spatial subdivision that accurately identifies floor and ceiling constraints for each point of the environment. Thanks to this spatial subdivision and some humanoid characteristics, an environment topology is computed. This topology accurately identifies navigable zones by connecting 3D cells of the spatial subdivision. Based on this topology several maps representing the environment are extracted. Those maps identify obstacle and step borders as well as bottlenecks. TopoPlan also provides a runtime library enabling the on-line exploitation of the spatial representation. This library provides several algorithms including roadmap-based path-planning, trajectory optimization, footprint generation, reactive navigation and spatial requests through customizable spatial selectors.

TopoPlan behavior is a library built on top of TopoPlan and MKM providing several behaviors described thanks to the HPTS++ task model. Its goal is to provide a high level interface handling navigation and posture adaptation within TopoPlan environments. Provided behaviors include:

-   A behavior handling fully planned navigation toward an arbitrary destination. This behavior precisely handles footprint generation within constrained environments such as stairs for instance.
-   A behavior controlling an MKM humanoid to follow a trajectory specified by the user.
-   A behavior controlling MKM to follow a list of footprints given by the user.
-   A behavior adapting the humanoid posture to avoid collision with ceiling. This behavior runs in parallel of all other behaviors and adapts humanoid motion when needed without any user intervention.
-   A behavior handling reactive navigation of virtual humans. This behavior plans a path to a given target and follows the path while avoiding collisions with other navigating entities.

Those behaviors have been built using the HPTS++ task model. Thus, they can be easily combined together or with other described behaviors through task operators.

{flv}TopoPlanHouseExample{flv}{flv}TopoPlanTestbed{/flv}