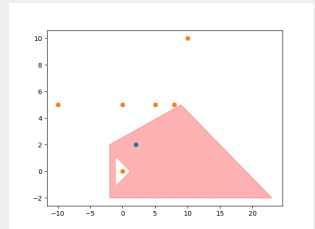


AUTONOMOUS MOBILE ROBOTICS

ENVIRONMENTAL MAPPING

GEESARA KULATHUNGA

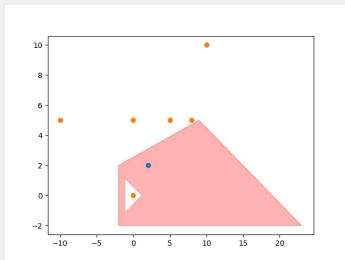
FEBRUARY 15, 2023



ENVIRONMENTAL MAPPING

CONTENTS

- Ray casting and ray tracing
- Ray-casting algorithm
- Winding number algorithm



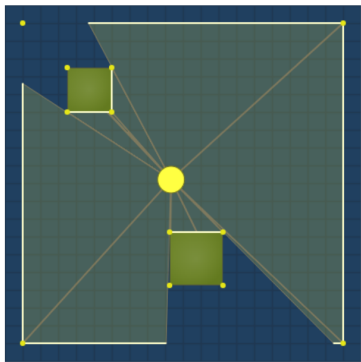
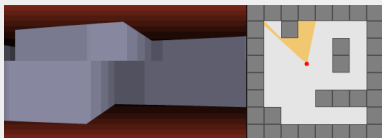
RAY CASTING



<https://www.mdpi.com/2071-1050/12/8/3281>

RAY CASTING

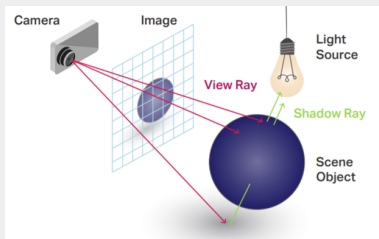
Raycasting, in general, is a rendering technique to create a 3D perspective in a 2D map. In autonomous navigation context, this technique can be used for obstacle detection in concave shapes.



https://pl.wikipedia.org/wiki/Ray_casting

RAY CASTING AND RAY TRACING

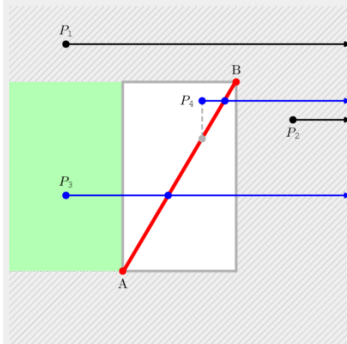
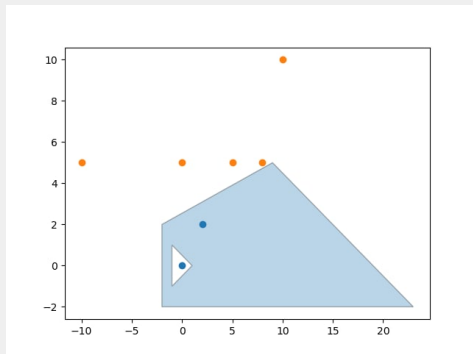
Ray casting is one of the rendering algorithms that use the geometric algorithm of ray tracing. Ray tracing is used to project three-dimensional scenes to two-dimensional images



<https://cs.stanford.edu/people/eroberts/courses/soco/projects/1997-98/ray-tracing/alternatives.html>, <https://gfxspeak.com/2020/09/28/the-levels-tracing/>

RAY-CASTING ALGORITHM

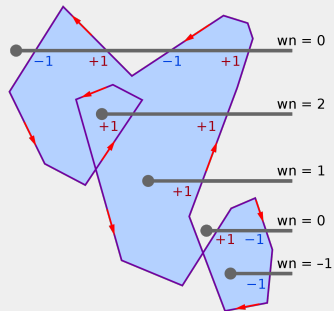
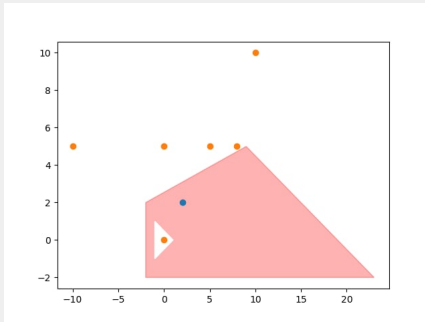
Given a set of points, check if each point is inside or outside the provided polygon using the ray-casting algorithm [1]



[1].https://rosettacode.org/wiki/Ray-casting_algorithm

WINDING NUMBER ALGORITHM

Check if a point is inside a polygon is to compute the given point's winding number with respect to the polygon. If the winding number is non-zero, the point lies inside the polygon using the winding number algorithm [2]



[2].https://en.wikipedia.org/wiki/Point_in_polygon

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