As we know, our world has been undergoing a major technological revolution. Many new types of mobile robots have been developed to work in places like hospitals, factories, or other public areas. While the robots help reduce tedious task or take on dangerous works, they have to ensure that they will not hit any people, cars, or other obstacles on their missions. Unfortunately, many of today’s navigation system still struggle with dynamic environments, highlighting their limitation in handling moving obstacles. This is a critical area where further improvements are needed.

So, I think a powerful navigation system is essential for the robot to work safely in complex environments. Therefore, my research focuses on expanding an obstacle-avoidance algorithm for a specific type of mobile robot called the General Bicycle Model or the GBM.

The GBM has a unique design. Unlike regular bicycles that steer by turning the front wheel, the GBM has two wheels that can rotate independently. This design allows it to move in any direction without changing its orientation—similar to how a crab moves. This flexibility makes the GBM highly maneuverable.

You may want to know how can we make the GBM avoid obstacle on its own in dynamic environments and reach its goal safely? It relies on an obstacle avoidance algorithm. This system can keep making decisions and help the robot develop a kind of “special awareness”.

* First, the robot must observe obstacles around it, measuring their dynamic parameters, like positions, velocities, and accelerations.
* Next, use probability model to predict those obstacles’ future positions and evaluate the risks of collisions.
* Then, the system will adjust the robot’s future path based on optimization, trying to find a shortest rout with minimum collision risks.

By continuously repeating these three steps in real time, the algorithm can let the GBM find the most efficient routs to its destination, without bumping into any obstacle.

If we can combine this improved navigation system with the GBM, we will be one step closer to fully autonomous robots. With a better strategy for avoiding obstacles, these robots could operate safely and efficiently, even in complex environments. In the future, they could serve as platforms for other autonomous systems, providing support wherever it’s needed.