Right now, our world is undergoing a major technological revolution. Many mobile robots are developed to be applied in factories, hospitals, or other places. While these robots help reduce tedious task or take on dangerous missions, they have to ensure that they will not hit any people, car, or other obstacle along their missions. Unfortunately, many of today’s navigation systems still struggle with dynamic environments, highlighting their limitations in handling moving obstacles. This is a critical area where further improvements are needed.

If a powerful navigation system could be developed for a kind of agile robot, we can operate this mobile robot in more complex environments, such as in train station or streets, without crushing into anything. Therefore, my research focuses on expanding an obstacle-avoidance algorithm for a specific type of mobile robot called the General Bicycle Model or GBM.

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

Furthermore, how can we make the GBM avoid obstacles on its own and reach its destination safely? The solution lies in helping the robot develop a kind of "special awareness." First, the GBM must observe obstacles around it. Next, predict those obstacles’ future position and evaluate the risk of collisions. Then, adjust its future path to minimize those risks. By doing the above three steps continuously and iteratively in real time, the GBM could find the safest route to move on its goal.

So, if we can combine the improved navigation system and the GBM robot successfully, we will move one step closer to achieving fully autonomous robots. With better strategy to avoid obstacles, these robots could safely and efficiently operate in complex environments. In the future, these robots could serve as a platform for other autonomous system and apply in where it is needed.