INNOVATIVE PROTOTYPE OF "UNMANNED SALT FARM SOIL LEVELING ROBOT", THE WORK OF MA STUDENT, PHIBO, KMUTT.

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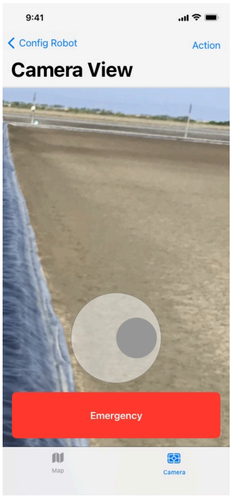
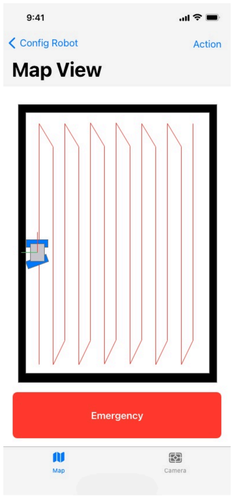
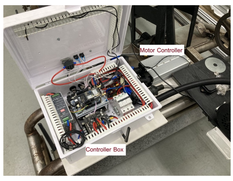
Nowadays, robots and electric vehicles are increasingly used in human daily life in many aspects and sectors. Recently, there has been an attempt to apply both technologies to the agricultural sector, especially salt farmers. **Mr. Narawit Nungsue, a master 's degree student at the Institute of Field Robotics or FIBO, King Mongkut's University of Technology Thonburi (KMUTT), has invented and developed the "5G Zero Carbon Automatic Soil Leveling Robot for Salt Farmers"** to help salt farmers save labor, reduce fuel costs, and adjust the soil in the salt fields to be smoother and firmer. It also helps reduce pollution and protect the environment. Assoc. Prof. Dr. Chit Liaowatana, Dr. Prakarnkiat Kong, and Asst. Prof. Dr. Thawida Maneewan are advisors. This research was supported by the vehicle used for modification from Mr. Aphorn Nungsue and received funding from the Agricultural Research Development Agency (Public Organization).





Mr. Narawit, the creator of the automatic ground leveling robot, said that the robot he developed is a driverless robot car to meet the innovation of salt field leveling of his father. It was modified from the original ground leveling or salt field roller car that used internal combustion engines and was driven by humans. Initially, this robot car was driven by the front wheels. The engine was changed to a motor that uses electric power from the battery. The working process of this robot car can be divided into 2 main parts: the planning process, which will act as a path for the car to move, taking into account the mechanics that are consistent with the car, including creating a path to create the shortest turning radius. The next process is the process of controlling the robot car to move along the specified line (from the previous process). The controller will gradually adjust the speed to prevent jerking. In addition, RTK (Real Time Kinematic Positioning) technology is applied for high-precision positioning and Inertial Measurement Unit (IMU) for indicating the direction of the car. This robot car has a width of 1.5 meters, a total weight of approximately 240 kilograms *(frame weight 160 kg + battery weight 80 kg)* , and a maximum speed of 1 meter per second. *(Speed level depends on the motor used)*

Mr. Narawit said that his family is a salt farmer in Phetchaburi Province and has been in the business since his grandfather's generation. Currently, his family still farms salt. The process of transferring seawater into the salt farm consists of 4 fields in order: the impounded field, the spreading field, the sedimentation field, and the placing field. When the salty water reaches the saturation point and is burned by the sun in the placing field, salt crystals will form on the soil surface. When the salt crystals are 1-3 cm thick, the produce can be harvested. After harvesting, the soil surface must be washed and leveled to be compact and smooth before transferring water from the sedimentation field to the placing field again. The reason for the soil leveling is because the surface of the placing field after harvesting will be rough, uneven, and uneven. If left as is, the harvested salt will have a lot of soil mixed in it.



"The method of land leveling that salt farmers have used for a long time is salt rolling. In the past, farmers used to use 2-4 people to pull one roller. Later, it was changed to using internal combustion engines with one driver sitting on the vehicle. Normally, it takes about 1 hour per round of rolling to cover the entire rice paddy *(1 rice paddy is about 100 x 50 meters or 5,000 square meters)*. Therefore, we see that currently, with technology that is increasingly advanced, if we can develop a salt paddy leveling vehicle with robotic technology and automatic systems, it should help save costs for salt farmers who are part of the Thai agricultural sector. In addition to reducing manpower and fuel costs, it also helps preserve the environment by not releasing carbon dioxide into the atmosphere and preventing leakage of lubricant and fuel into the rice paddy," said Mr. Narawit.

The 5G Zero Carbon automatic ground leveling robot is still just a prototype. It has not been tested in a real area yet because the salt farming season has ended and the rainy season has begun. However, it has been tested at the university and found that it can drive, reverse, and move forward like a normal car, but without a driver. It can also be monitored via a mobile phone. However, this work is still considered the first prototype robot that has been invented and developed to meet the needs of salt farmers. It was created from the father's idea and developed by new-generation students who did not abandon their family's traditional careers. They have developed it further to increase value by applying their knowledge of robotic technology and automation systems.

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