

Autonomous Atmospheric Water Generating Robot for Developing Ecosystems in Drought Areas

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In drought areas, water-scarcity induces an annual rate of 40% pre-mature plant deaths around the world. Present-day solutions rely on methods to transport water from either surface level storages (lakes, reservoirs, and rivers) or underground storages (aquifers). Although there is an adequate supply of moisture in the atmosphere, currently there aren't feasible techniques to tap that water for irrigation. Additionally, current drip and sub-irrigation systems are permanent structures that they cannot be redeployed in times of need. To combat this issue I have developed an autonomous robot that generates water locally from atmospheric moisture and irrigates plants, which can also be redeployed in multiple locations as per need. My Robot consists of 3 parts: Atmospheric water generator (AWG), Machine-learning model that identifies plants, Autonomous robot vehicle to carry the AWG and water dispensing systems to traverse the land. I built the AWG on condensation cooling method and developed the machine-learning model on Tensorflow (TF) framework with Keras API. I tested the performance of AWG water collection with multiple freezing mixtures and attained a minimum of 0.5~1 liter per 8 hours. I trained and tested the TF model with 13138/6627 images and achieved a minimum plant identification accuracy of 97%. I statistically analyzed the test results using confusion-matrices and the Performance Metrics of the TF model are [Accuracy-97%, Precision-97.3%, and Recall-96.8%]. I have field-tested the robot vehicle in the following terrains Chalky soil, Sandy Soil and Beach Sand on navigation and Obstacle Avoidance.