Effect of Mud Conditions in Mangrove Forests on Rowing Motions of Robotic Mudskippers: A Novel Anticipation Method on Reforestation and Ecosystem Rehabilitation

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Mangrove forests are well-known for their fertility and are important ecosystems of South East Asia. Although conservative attempts, such as reforestation, have been vastly made, the area size of the projects do not correspond directly with the survival ratio of the plant and mangrove forests have still been continuously diminished. This has brought our attention to the exploration of local Mangrove forests. We have observed that the most prominent organism living in the natural mangrove ecosystem is the mudskippers, Periophthalmodon schlosseri. However, this is not the case in the newly reforested mangrove site. The living condition of mudskippers could be a major indicator of the success of the mangrove ecosystem rehabilitation. We have observed different patterns of mudskippers' movement of which the rowing is the most common one. Our experiments have indicated that mud's viscosities at each mangrove sites were different and affect on mudskippers' rowing. Previous researches have reported the effects of mud's conditions on the mangrove reforestation. Therefore, we have developed robots that imitated mudskippers' morphology and fin rowing motions to study their motions under different mud conditions. Utilizing the robotic mudskippers in controlled as well as field experiments, we found that the mud viscosity had effect on the speed of the robots. We also tested our robots in possible mangrove locations and able to identify the mud conditions that is suitable for reforestation. The results indicated that our robotic mudskippers can be used as an effective anticipation method on the success of mangrove reforestation and ecosystem rehabilitation.

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