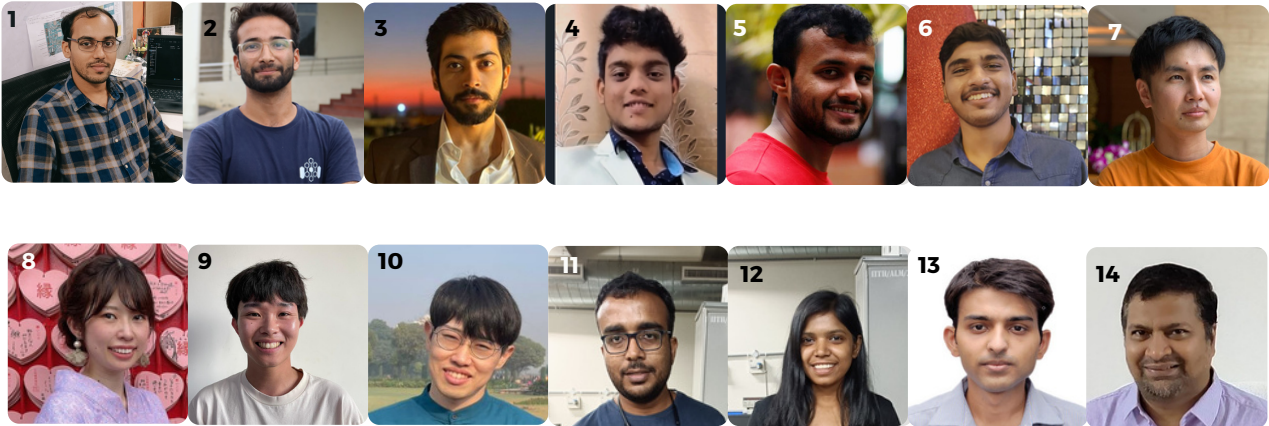


IoT-enabled aquaculture monitoring system to assist the fish farmers (MizuGuna 01)



KID: 20230104

1. Introduction:

Rural Development Center (RDC) at IITH was established with a vision to support rural development initiatives of the Government of India through innovative technologies being developed at IITH. We have interviewed nearby villagers and came to know that farming is their major source of income and fish farming is one of the most profitable farming for them. The government is providing fish ponds & fish seedlings (child fish) free of cost to improve the livelihood of nearby 35 villages. Still, the profit margins are very less due to fish mortality and ignorance of fish farming, water quality, and similar parameters. We took the challenge to support them technically by intimating water quality through a web application. The same web portal can be used by any entity to monitor water quality and take preventive measures.

This project has been initiated by Prof Shiv Govind Singh in collaboration with Dr Abhinav Kumar. Later on, Mr Chinmaya Panda joined to lead the project technically and deliver the product on time. The technical team consists of 3 IITH students (Mr Pranadipan, Mr Abhay, Mr Amandeep), One IIIT Raichur student (Mr Vibhanshu Jain) & 4 members from Suzuki Motor Corporation (Mr Aoki, Mr Taichi, Mr Shu, Ms Miwa), working with Suzuki Innovation Center (SIC). We also thank IITH MTech student Mr Tushar & Interns Mr Mandeep, Ms Sradha for their support during the initial phases of the project. We followed PDCI (Plan Design Check & Improve) method or Agile flow throughout the design cycle.

2. System design:

We designed a network of Sensor Nodes spread across fish farms, which continuously monitor water parameters like Temperature, Total Dissolved Solid (TDS), pH, and Dissolved Oxygen (DO)

We have several interlinked AWS services to store the data in Database and preprocess it and render it to web applications. Finally, all users will see the data in our web application. By monitoring the parameters, the farms or concerned authorities will take the required action to improve water quality, fish productivity, the health of fish & fish mortality.

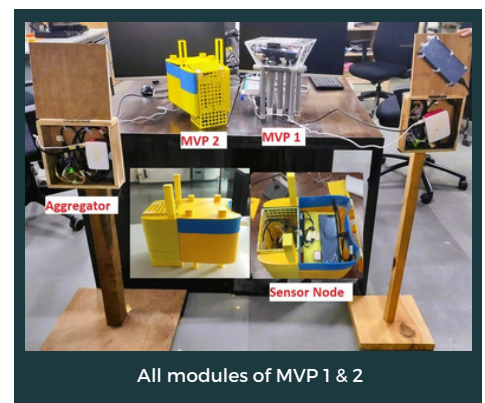
We designed our Minimum Viable Product 1 (MVP 1) around Dec 2022 with basic sensors, acrylic casing, and a simple web application to monitor the data. Then we developed our MVP 2 around the month of March 2023 with improved functionalities. MVP-2 has highly accurate sensors, 3D printed casing & AWS cloud services. The casing has been designed in such a way that the product will float on water and can sustain basic applied forces from any direction. The casing has 2 distinct parts. Part one is for electronic circuits, which are completely waterproof & second part is a perforated chamber for sensors. With help of perforated holes, the water will interact with the sensors and also the sensor tips will be protected from external impacts. Aggregators will be placed in an indoor environment, so one wooden stand with circuitry and wireless modules has been installed.



Nearby 35 village fishermen, Fishery Officer of Sangareddy & IITH technical Team

One of the objectives of the RDC-01 project is to improve the productivity of Fish farmers by providing technology to monitor water quality and scientific knowledge on fish farming to avoid fish mortality.

and send data to the web portal through AWS cloud services. Each sensor node has wireless modules, which will send data to the nearby wireless receiver or Aggregator, and the aggregator has internet connectivity, so it will send filtered data to AWS cloud services.

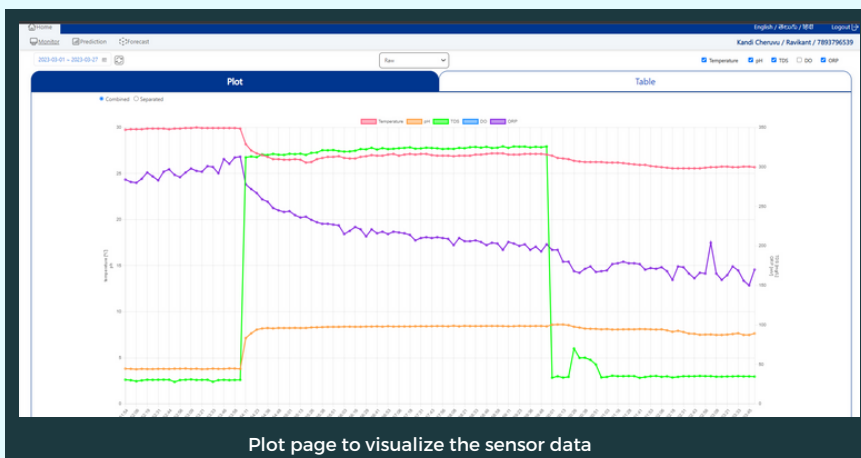


All modules of MVP 1 & 2

We have done several fields and floating tests to observe the device stability, floating conditions, wireless communication range & failure cases.

We have hosted our web application with the domain name <https://jalagunaciketi.in/> Where the jala = water, guna = quality, ciketi = to observe, in combination, the domain name is for water quality observation.

As this project is a collaborative effect of IITH & SIC and has Indian and Japanese developers so the product name has been decided as Mizu Guna 01 (Mizu = water, Guna = quality).



These web applications have lots of functionality. At present time we have demonstrated the Plot & table option of raw data for only one pond that we have considered for our experimentation.

We took the support of the Local fisherman community president. We had given basic instructions for device use, and operation, how it's important and how to understand the web application data.

To train the fishermen, we have created a tri language (English, Hindi, Telugu) training platform with lots of information, videos and animations. Time to time we will collect the information from the scientific community and will share the knowledge with fishermen to improve the fish quality and productivity.

3. Conclusion:

This product needs lots of modifications and has various future scopes. Not only inland fish farming, but similar products can also be used for Biofloc fish farming, prawn farming, ocean farming, and so forth. We are trying to get the exact water quality for different kinds of fish with different environmental conditions. With our collected data, we are going to implement various predictive models to assist farmers in decision-making. Also, we are interested in low-cost sensor designs to reduce the overall cost of the product. We have started working on the next product version i.e. MVP 3, with lots of advanced functionality by considering its global impact.

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(Background): Field test, where farmer seated above one boat is pulling the sensor node towards the middle of the pond by the help of one rope