Smart India Hackathon 2019 – Hardware Edition

INVENTION DISCLOSURE

1. Title of Invention: Remotely Operated Vehicle (ROV) for inspection of the HRT (Head Race Tunnels) and detect pH level in Hydro-electric Plant.

2. Date:28-05-2020

3. Field of Invention (e.g Chemical, Mechanical, Electrical, Biotechnology, Electronics, Medical System, Miscellaneous): Robotics and Drones

4. Name and contact details of the Inventor: Vihang P.Pathak

Email ID:vihangpathak64@gmail.com

Phone no: +919561149446

5. Whether your invention is product/Composition/ Process/Equipment/Device/System?

System

6. Problem in the prior art, e.g prior patent, prior reported literature (Give relevant prior art and state the problem of the prior art based on patent and literature search). Prior art search may be conducted using keywords from inventive area. Conduct prior art search use public databases e.g. https://scholar.google.co.in https://patents.google.com http://www.wipo.int/tools/en/gsearch.html https://worldwide.espacenet.com/?locale=en_EP https://search.uspto.gov/search?query=+&op=Search&affiliate=web-sdmg-uspto.gov http://www.tkdl.res.in/tkdl/langdefault/common/TKDLSearch.asp?GL=Eng :

Keywords Used: Remotely Operated Vehicle, Control System, Size Optimization, Drag minimization , Hardware Design, Software Design, Mechanical Design.

Prior Art (Literature Closest Match):

1. **Designing: https://ieeexplore.ieee.org/document/7271511**
2. **Control System: https://ieeexplore.ieee.org/document/8441832**
3. **Drag Reduction: https://ieeexplore.ieee.org/document/8441832**

Prior Art (Patent Closest Match):

1.Control system for remotely operated vehicles for operational payload employment https://patents.google.com/patent/US6694228B2/en?q=remotely+operated+vehicles&oq=remotely+operated+vehicles

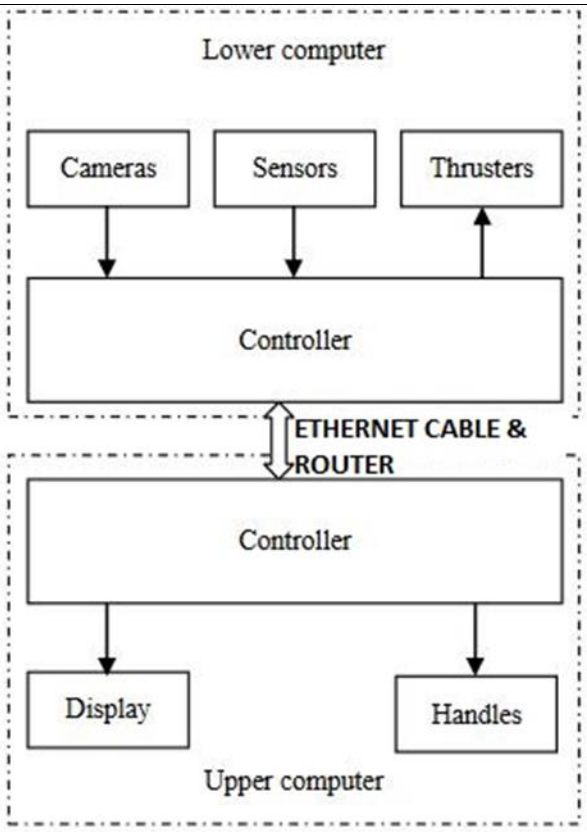
2. Marine seismic survey systems and methods using autonomously or remotely operated vehicles
https://patents.google.com/patent/CA2811492C/en?q=remotely+operated+vehicles&oq=remotely+operated+vehicles

4. Statement of invention e.g state your inventive area and what solution you are providing to solve the problem not addressed in prior art:

The invention is for inspecting HRT(Head Race Tunnel) of a hydro electric powerplant

1. **Manual inspection of the HRT is a tedious job as we have to clear the tunnel leads to wastage of water.**
2. **Over years of usage cracks also occur on the lining of the tunnel leading to water leakage so we can detect the cracks by dye injection method and also repair them.**
3. **Detection of pH levels as it has been reported that during the monsoon acidity level increase.**

5. Describe your invention with working model/ example;(e.g if the invention is product/composition, give details of product composition in the form of range at least, Give working example (testing result of composition and properties, If it is process, give process flow chart mentioning process parameters, at least in range, give working example. If it is system operated based on algorithm, give the hardware/unit details and how the algorithm is affecting the functionality of the unit)



1. We have applied a server client relationship in this project where our laptop/computer is our client and the Raspberry Pi 3B+ which is the lower computer is our client
2. The medium of communication is through a network where both server and client are connected to the same network ie the router which provides connectivity via CAT5 Ethernet cable to the client and Wi-Fi to the server PC we can use services like SSH VNC server to access the client.
3. We have written a python code which takes values from the keyboard of the server PC to control the maneuverability's of the ROV.
4. Simultaneously getting a live feed from the camera module also recording the entire plant via GoPro.

6. Identify the novel features (Just put in bullet form, e.g….Algorithm to detect signal in the signal system components)

1. Raspberry pi :It is the heart of the entire system responsible for driving the thrusters, capturing live feed via camera module, recording pH values and displaying , controlling the syringe pump and toggling LED lights.
2. Syringe Pump: This device actuated by NEMA17 stepper motor is for detecting cracks by injecting a fluorescent non-toxic dye. Whether the crack is actual or just a surface erosion would be injecting this dye near the suspected crack.
3. pH sensor :To monitor the acidity level at various points in the various parts of HRT.
4. Fiber Optic Router: The network connection to both the computers .

NOTE: Use of Ethernet cable basically provides stability to the ROV as it is a light tether compared to a bunch of wires to drive the thrusters.

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7. State possible application of your invention:

1. Thus invention can be used to discover underwater ecosystem in a lake.
2. Can do underwater exploration where human divers cannot dive in.
3. An ROV can stop, hover, and bring back an object or water sample to the surface using a manipulator arm or other mechanical device.

I hereby declare that, to the best of my knowledge and belief, the particulars given above and the declaration made therein are true.

Signature of the Corresponding Inventor

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