

Comtel Consultants & Infraprojects Pvt Ltd



IoT Based Dam Gate Anomaly Monitoring And Detection Along With Water Usage Optimization

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LITERATURE REVIEW



Fig.1: REMOTE SENSING SENSORS*



Fig.2: DRONE MONITORING SYSTEM*

*Source: Pictures collected from Google

PROBLEMS FORMULATION



Fig.3(a): GATE DAMAGE



Fig.3(b): WATER SHORTAGE



Fig.3(c): DOWN STREAM FLOODING

Fig.3: DURGAPUR BARRAGE GATE DAMAGE INCIDENT, NOV 2020



Fig.4: WATER OVERFLOW



Fig.5: LONG TIME GAP BETWEEN INCIDENT AND ACTION TAKEN

PATENT REVIEW

PATENT NO;YEAR	INVENTOR	DESCRIPTION
05177153U; 2016	Xiamen Huaxia University	<ul style="list-style-type: none"> • Fibre, satellite, power bus communication. • Information management switchboard. • MCU, CCU based early warning system
01177679Y; 2008	Zhou Zhengxian	<ul style="list-style-type: none"> • Optical fibre based layered sensing cable. • Notify cracks beforehand. • Cannot control other dams simultaneously.
19533041A1; 2008	Tooni Hara Kenichi Kobori	<ul style="list-style-type: none"> • Crack inspection device for a concrete structure • storing raster data , • A data synthesizing unit matches and synthesizes the vector data of the crack
104906A; 1977	Donald H. Oertle	<ul style="list-style-type: none"> • Early crack detection in non-permeable surfaces. • Operate under various pressures. • Non intelligent system.
145915A; 1977	Donald H.Oertle, Marvin L. Peterson	<ul style="list-style-type: none"> • Early crack detection in non-permeable surfaces. • Non intelligent system.

Table.1: PATENT SURVEY

By Team 05

WORKING PRINCIPLE

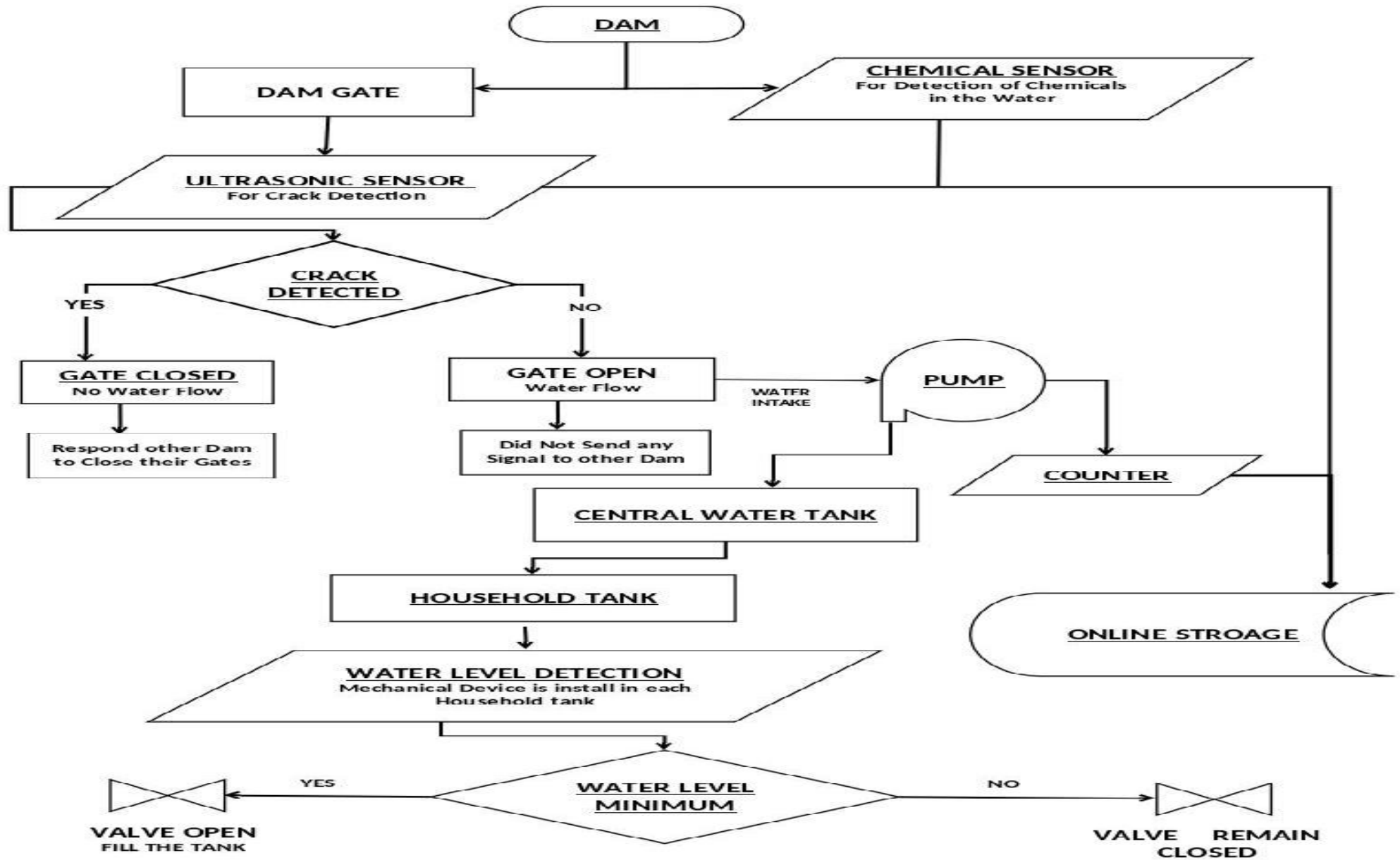


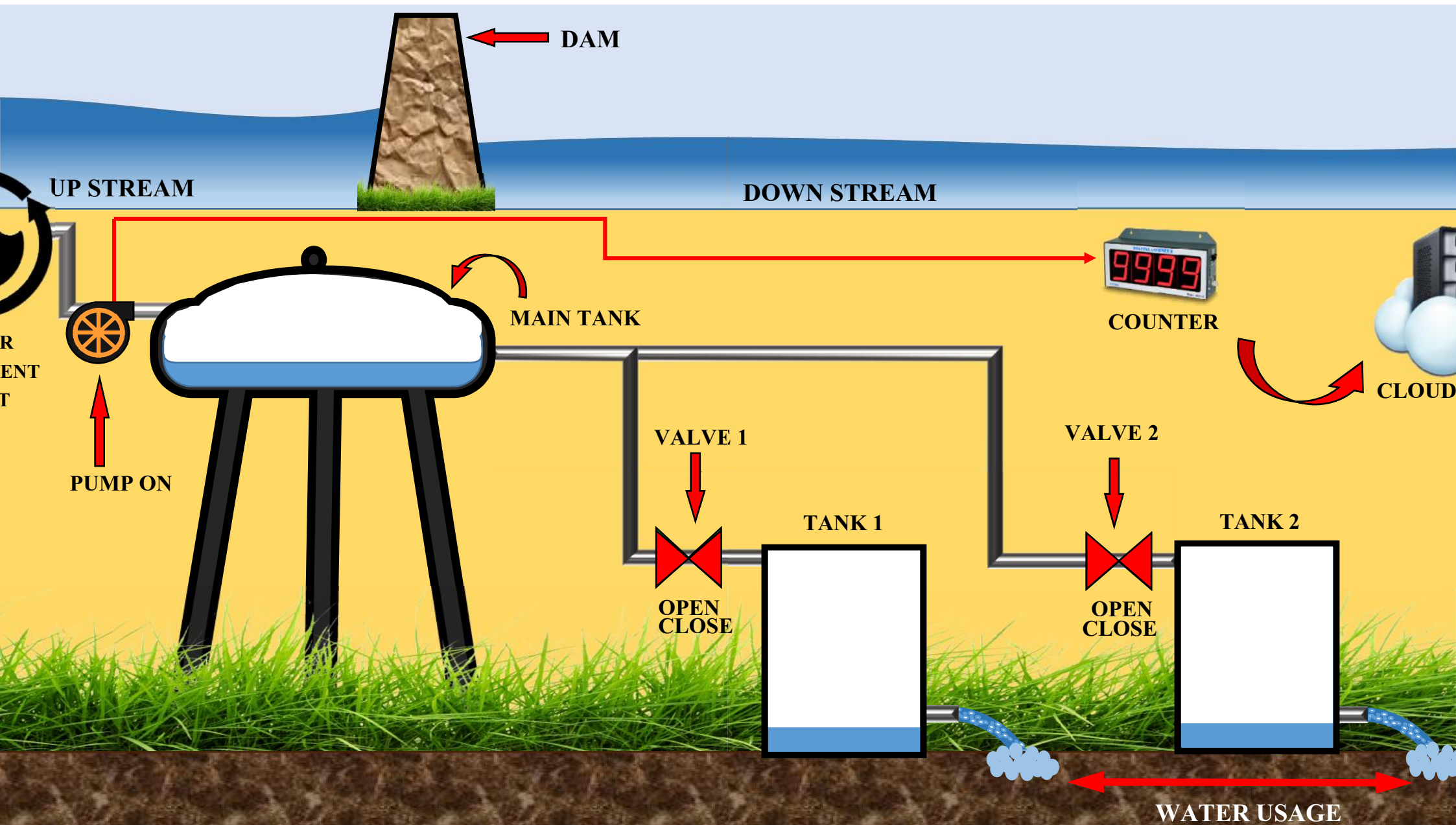
Fig.6: ANOMALY MONITORING FLOWCHART

By Team 05

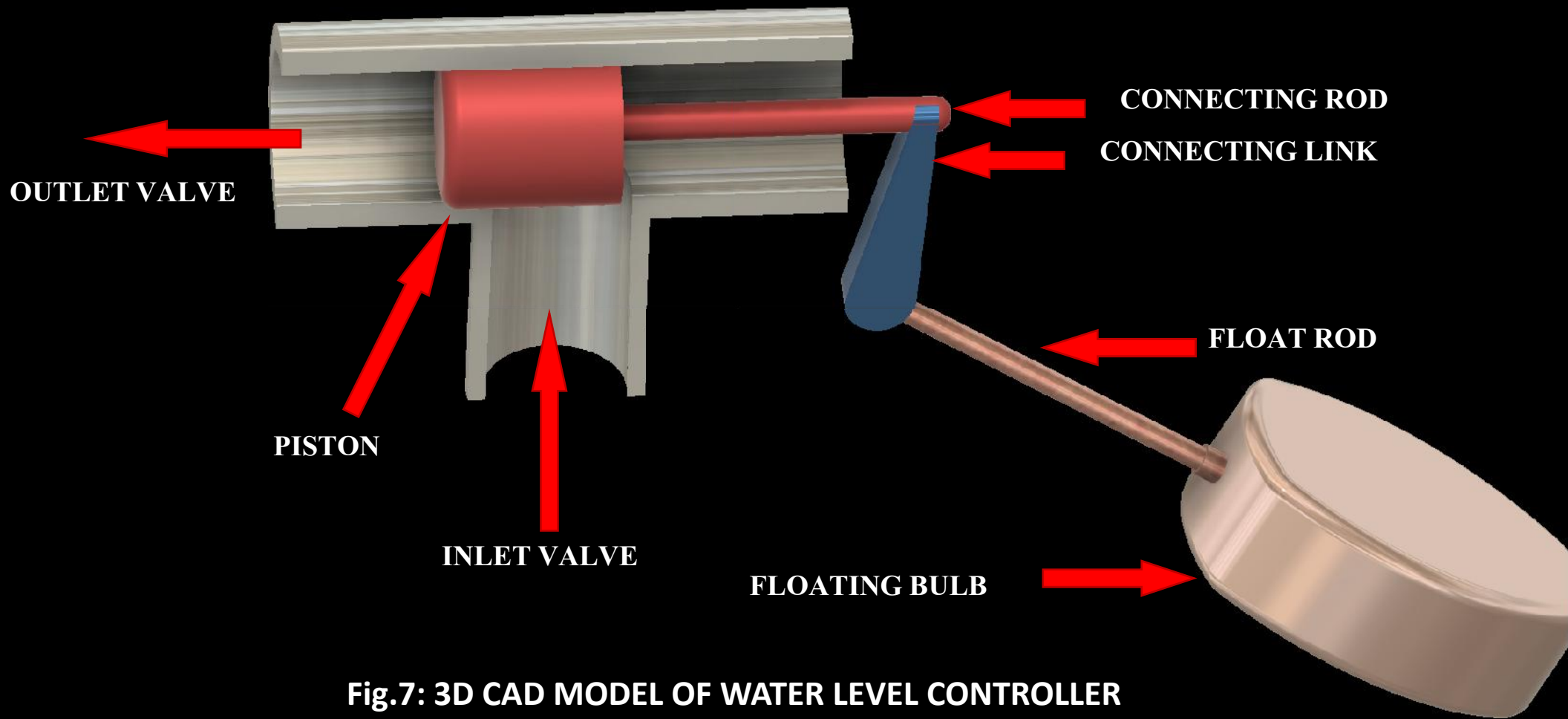
PLACEMENT OF SENSOR ARRAY

Animation.1: WALK SHOWING PLACEMENT OF SENSOR ARRAY

*Note: Please play the animation



Animation.2: ANIMATION SHOWING WATER USAGE CONTROL AND DATA COLLECTION



IoT BASED DAM OPERATION CONTROL

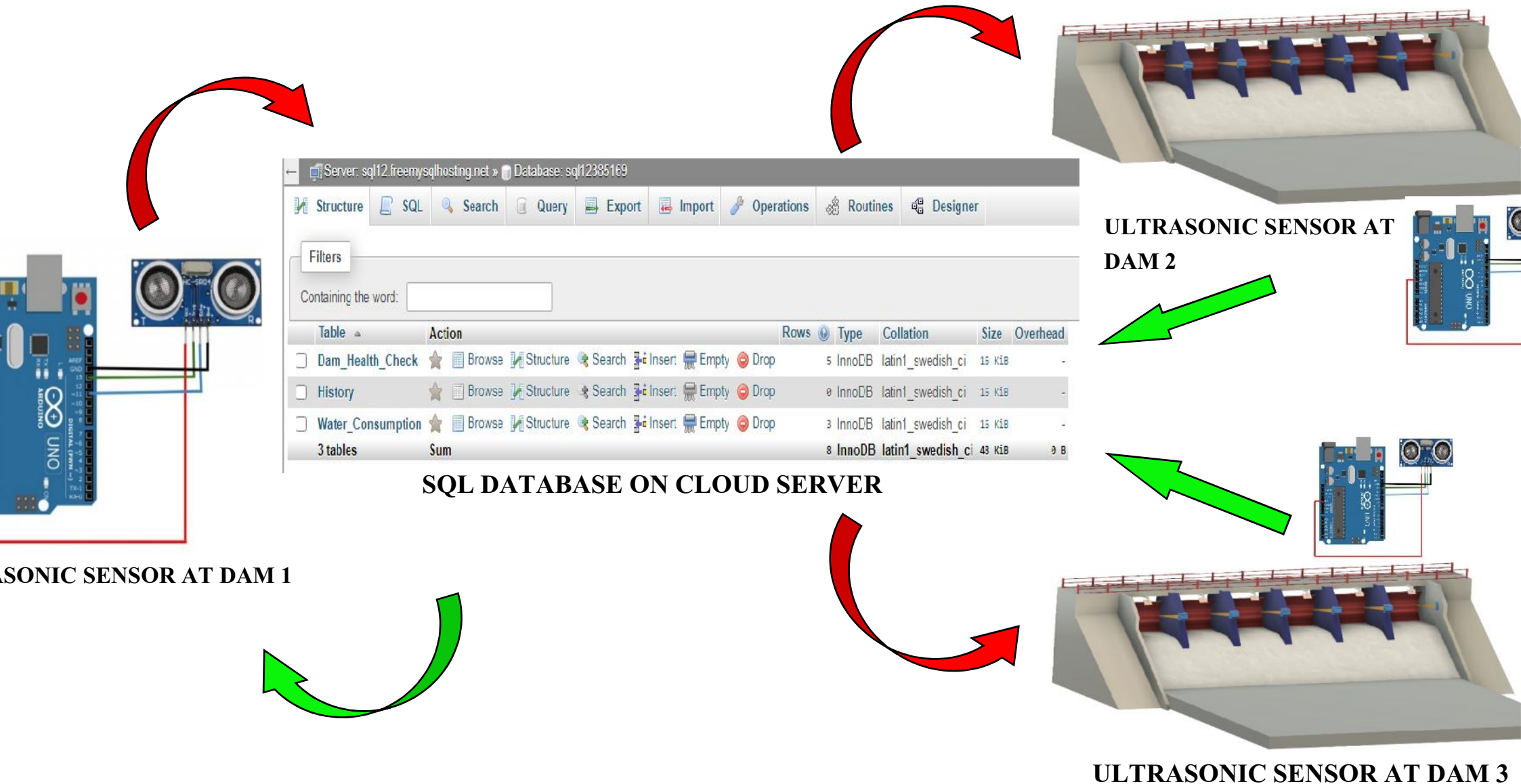


Fig.8: IoT BASED CONTROL OF DAM GATE OPERATIONS

RESULTS

WATER CONSUMPTION DATA

Water consumption data have to be entered here

*Required

Dam No *

Dam 1

Dam 2

Dam 3

Locality *

Please enter Pin code of the locality

Your answer _____

DAM HEALTH CHECK

This form represents the data that will get directly uploaded to the live server from sensors. Due to the absence of a real time sensor and server google form is used to represent similar function.

* Required

DATE *

Date: 00-01-2021 Time: 04 : 56 AM

Dam No *

The Dam for which the following data would be entered.

Dam 1

Dam 2

Dam 3

Ultrasonic Status *

States the detection of any kind of anomaly of the dam gate, DOWN in case of any anomaly or

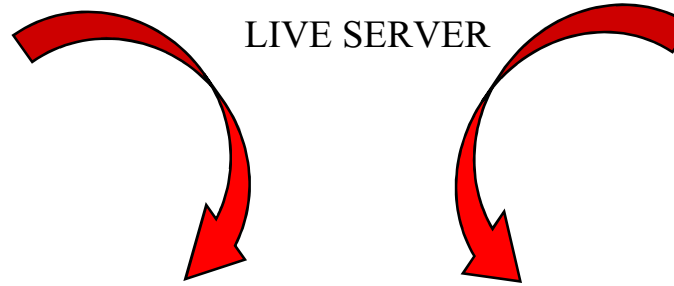
OK

DOWN

Pressure status *

Shows the water pressure during each round of Dam Health Check in PA

ON SUBMISSION OF GOOGLE FORMS
DATA GETS AUTO UPDATED ON
LIVE SERVER



Server: sql12.freemysqlhosting.net » Database: sql12385169 » Table: Water_Consumption

Showing rows 0 - 2 (3 total, Query took 0.2265 seconds.)

```
SELECT * FROM `water_consumption`
```

DAM_NO	LOCALITY	TANK_NO	TANK_CAPACITY	PUMP_ON_COUNT
Dam 1	713208	4	12000	2
Dam 2	713204	6	500078	2
Dam 2	713205	7	10000	2

Server: sql12.freemysqlhosting.net » Database: sql12385169 » Table: Dam_Health_Check

Showing rows 0 - 2 (3 total, Query took 0.2266 seconds.)

```
SELECT * FROM `Dam_Health_Check`
```

DATE	DAM_NO	ULTRASONIC_STATUS	PRESSURE_STATUS	DAM_2_STATUS	DAM_3_STATUS
2021-07-31 15:33:00	Dam 1	OK	50000	CLOSE	OPEN
2021-07-01 02:00:00	Dam 2	OK	50000	OPEN	OPEN
2021-07-31 16:26:00	Dam 3	DOWN	11000	CLOSE	CLOSE

Fig.9: AUTO UPDATION OF LIVE SQL SERVER DATABASE

WORK DONE SO FAR

- Database created and hosted on a local server.
- Respective tables have been created within the same database.
- Google forms created and stored on Google cloud.
 - Google form for water consumption link : <https://forms.gle/ffamSgVcS1kh98986>
 - Google form for dam health check link : <https://forms.gle/MDi4nhZEq2rLaHXP9>
- Testing of the data acquisition using a live server is successful.

WORK YET TO BE DONE

- Program for regular monitoring to be written and included as cron job.
- Real time data collection using sensor and uploading that to the server.
- Real time implementation and testing of the complete system together.

REFERENCES

- https://www.researchgate.net/publication/328747877_Detection_assessment_and_monitoring_of_common_anomalies_in_concrete_dams : Silva, João. (2018). Detection, assessment and monitoring of common anomalies in concrete dams.
- Shi, Pengfei, et al. "A novel underwater dam crack detection and classification approach based on sonar images." *PloS one* 12.6 (2017): e0179627. <https://doi.org/10.1371/journal.pone.0179627>
- Mohan, A., and S. Poobal. "Crack detection using image processing: a critical review and analysis. *Alexandria Engineering Journal*.(2017)." <https://doi.org/10.1016/j.aej.2017.01.020>

THANK YOU

FOR YOUR KIND ATTENTION