Monitoring of remote S/S through Robotics, Augmented Reality and Artificial Intelligence

TATA POWER

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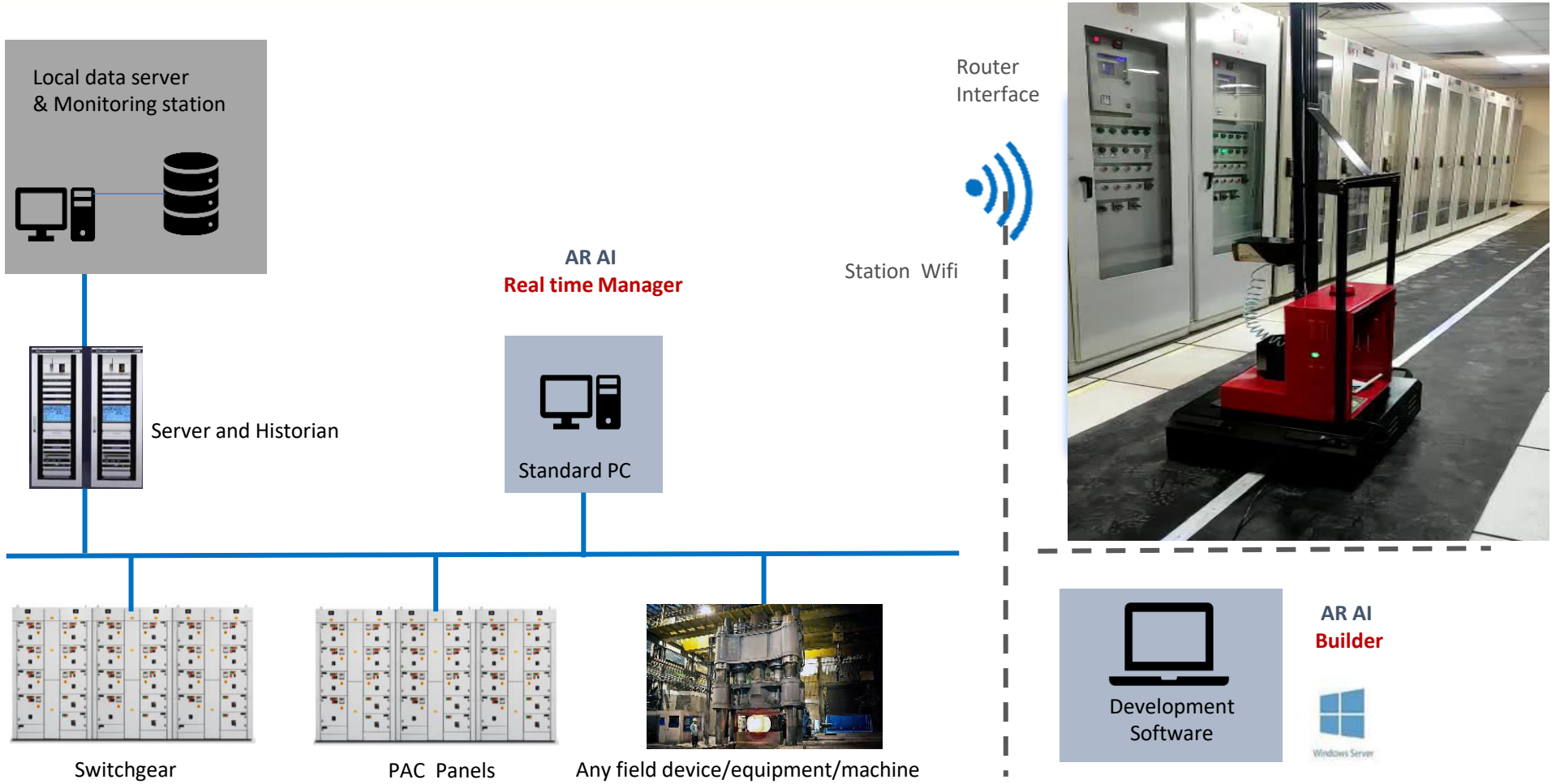
Introduction

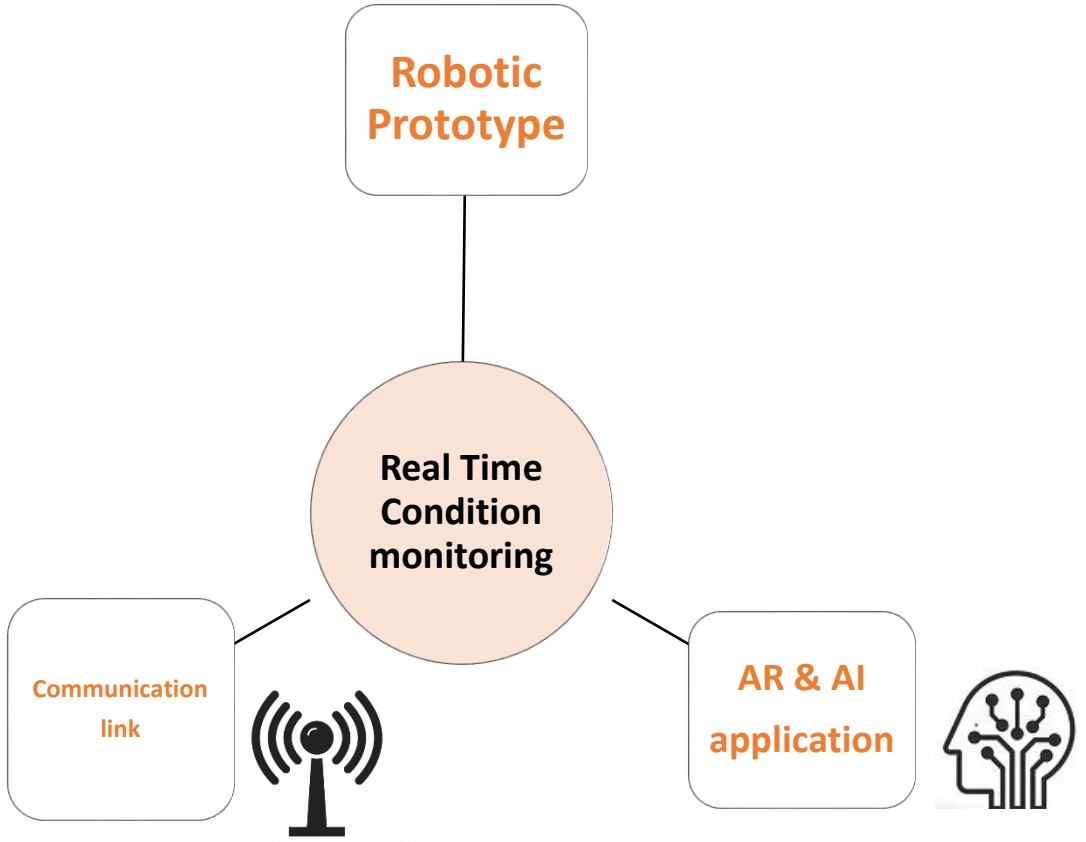


Trigger for Improvement

- Challenges in reaching Grant Road SS in time
- Multiple rounds of travelling is required for troubleshooting
- Co-ordination required between various O&M teams at sites during emergency situation
- Absence of centralized information due to multiple OEM legacy equipment's
- Holistic view of real time electrical system information, status of equipment was not always available in field
- Virtual view of live equipment was not available for trouble shooting system problems
- Possibilities of Human errors during complex procedures can lead to safety concern

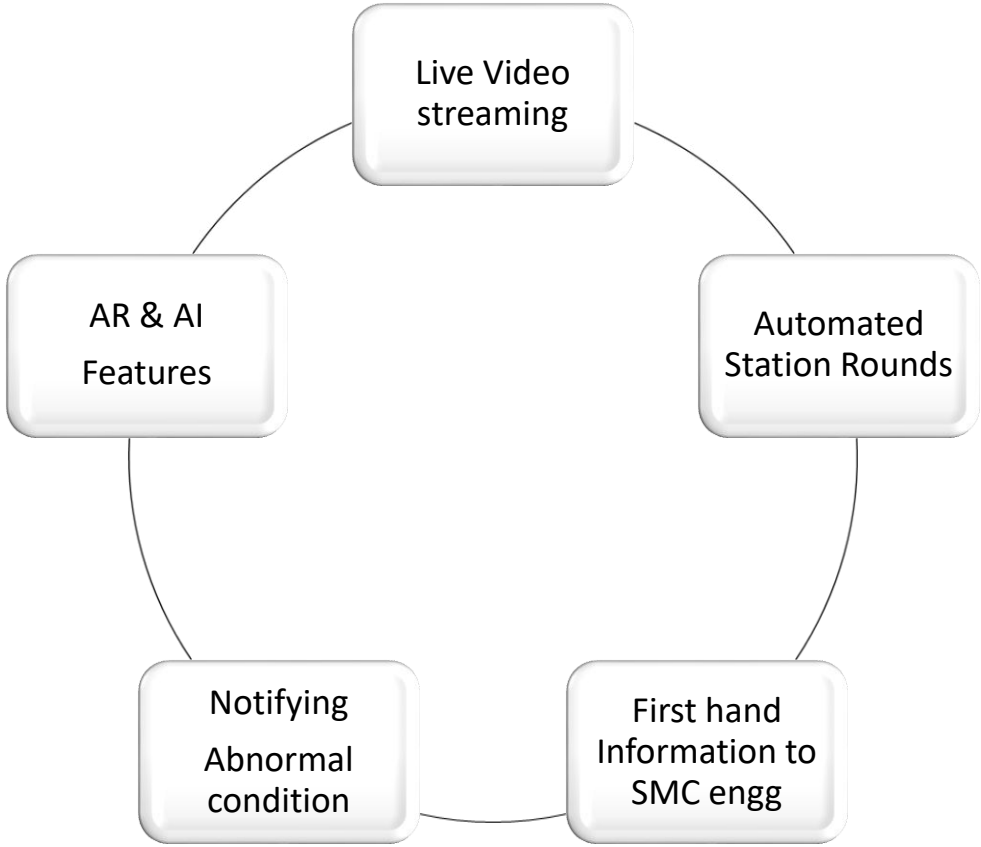
Relevance : Remote monitoring of SS through Robotics, AR and AI

- A first of its kind –SS monitoring Robotic system, Fully Automatic and loaded with advanced AR, VR & AI features
- Robot Automatically starts with Station rounds and docks itself to charging
- All observations of O&M rounds are taken by remote robot programmed to work in 3-shifts
- Virtual Reality & Augmented Reality dashboards are build on centralized workstation
- Historical Reports is stored and also viewed on email



Remote monitoring of SS through Robotics, AR and AI

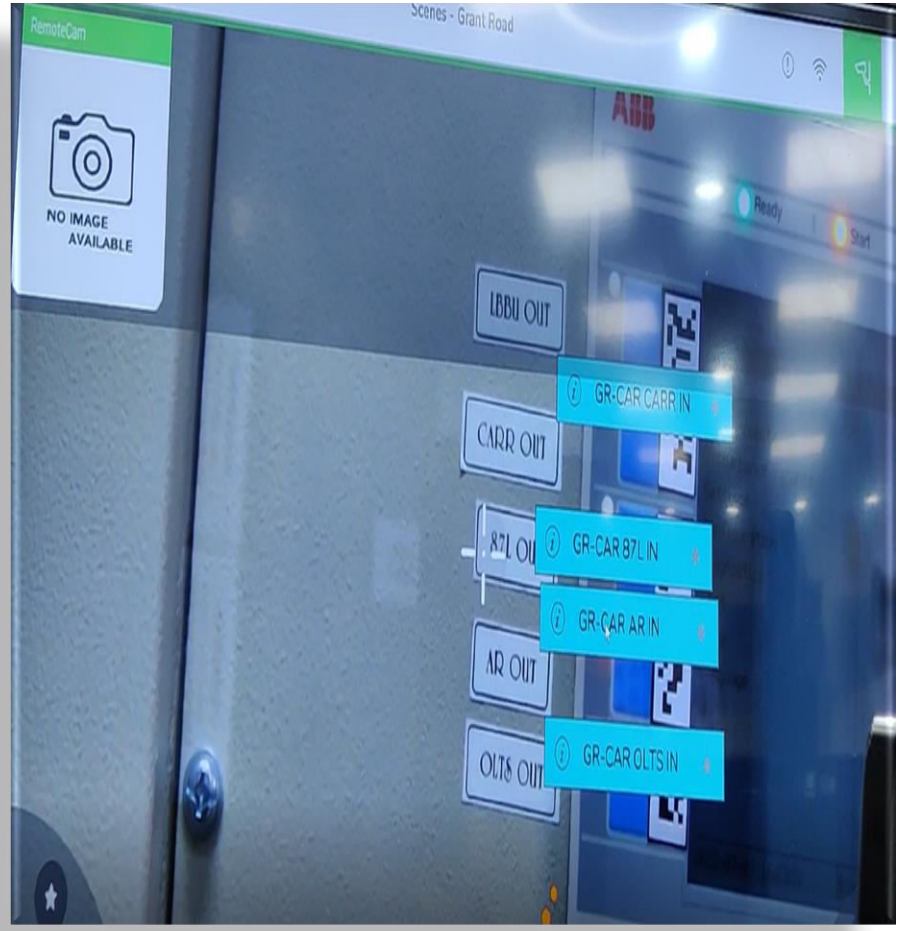
- Advanced Augmented Reality (AR) features were developed to superimpose real-time data & virtual objects on to the real system environment.
- AR application puts real-time information and relevant information at your fingertips, whenever and wherever it is needed.
- Digital application developed to guide real time operations and monitor the parameters of all Station Equipment.



Actual Implementation Use Case

- On duty SMC engineer in evening shift takes daily rounds
- Average 45minutes travel from Carnac R/S to Grant road R/S
- Added 20minutes Filling checklist on GE-APM platform using Tab
- There are around 61 points included in condition monitoring
- This whole process takes around 2 hours

- Cycle Time for daily rounds was to be reduced
- Reliable Automated mechanism was required for condition monitoring from remote location



Actual Implementation Use Case

- Robot is a line follower, having line sensors for detection of path.
- It is having Proximity sensor for detection of obstruction
- Equipped with camera mounted on the slider
- Robot is powered by 12V 7AH battery, 3-4 rounds one with full charge
- Camera resolution is 12MP with 5X optical zoom
- RFID sensors are present for detection of RFID tags
- Remote command, Webserver development, relaying camera footage is done through ARM processor
- Motor controlling is done through AT MEGA microcontroller

Actual Implementation Use Case

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Condition Monitoring Robot

Deployed at Grant Road Remote Sub-Station

Key Takeaways/ Recommendations

- Conventional process of O&M condition monitoring has changed through this innovation project
- O&M personals benefit with significant savings in time, cost & efforts
- More stations will be added to the daily maintenance rounds
- Easy of recording data and abnormalities on-the-go
- Customized advanced AR view, dashboards. Hence physically carrying manuals, logs, logic data, data sheets is not required. This will save significant time in maintenance operations
- Effective tool for training new engineers on all different OEM makes and types of systems / equipment's
- Centralized Server, Historian for Remote monitoring

Thank You

For discussions/suggestions/queries email: ***isuw@isuw.in***

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Links/References (If any)

Economic Rationale

- Investment of 7.5 lakhs for Robotics, hardware, software, routers, RFID carpets and remote end workstation
- Optimized (with cost savings) Investment of 10 lakhs with 3 Nos. remote Robots for Powai and Kurla GIS stations
- Annual cost saving 24.4 lakhs on Routine O&M, preventing O/H Line Tripping's and ROE on Grid availability
- Travel and vehicle management O&M expenses is significantly reduced
- Remote Condition monitoring by O&M personals gives significant time and man hours savings
- In case of power failure LIVE data helps in faster decision making & faster restoration, increasing Equipment availability and Grid availability