ShowCase

Augumented Reality and IoT. Data Center Maintenance and Indoor Navigation

Products

Augumented reality integrated solution for asset, inventory management and maintenance activities. It is a replication of the data center (CED) in 3D.

Results

Economic values at stake:

In this context an integrated Augumented Reality/IoT solutionof predictive maintenance, may result in possible benefits, that are about 5-10% of the maintenance costs baseline.

Obviously, savings depend on the starting situation (more or less efficient) and on the effectiveness through which thre solution is implemented.

Introduction

Sogei's project idea is to provide an integrated management system in augmented reality. Through the future realization of a Digital Twin, it innovates and makes the maintenance process of a data center's hardware systems more efficient. In this way it will minimise accesses to an area which is sensitive and with not suitable environmental conditions for extended stays (decibels, air flows and low temperatures).

The images repository can be realized with "laser scanner" technology or through a photographic workflow (to be implemented when installing and / or modifying and / or removing of racks and systems), in order to have a real digital replica.

The application can be displayed in 2D mode on smartphones. The App will read proximity TAGS as NFC and/or BLE. Each rack is equipped with NFC/BLE TAG configured with its own URL ASSET.

Here's three different operational scenarios referred to the maintenance activity:

A. Remote Maintenance

The operator remotely accesses the data center's 3D replica through a web console. He personally browses environments subject to maintenance; controls and manages HW systems. Pointing with the mouse the virtual image of a rack and clicking on a system, a popup will show electrical absorptions, asset table, active alarms and rating plate data. The operator can act on the system as if he/she was on site but he can open an intervention ticket for on-site maintenance at any time.

B. On-site Maintenance

In the event that human intervention is required (for HW replacement or new installations), technical staff will be provided with a smartphone having a specific APP already installed. This APP is dedicated to the maintenance ticket management and to the IoT indoor

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Project Details

Beneficiaries of the measure:

-Medium/Large Data Centers
-Paper-based archives
-Department stores
-Asset Management
-Storage Environment
-Physical and Perimeter Safety

Project timing

Currently, an operating prototype allows indoor navigation, ticket management and 3D modeling , starting from a SVG file.

IoT predictive maintanence solutions are under study in the Energy Management context.

localization, and guides the user in the place and in the exact position of the system, for which the intervention is requested.

At the starting point, the technician opens the APP and calibrates the smartphone sensors.

The APP connects to a "server application" that defines the "workflow" for that user.

The technician, together with the Data Center Manager, activate the APP maintenance request. The APP shows the ticket with a "code" and the "target" to be maintained (e.g. a "server").

The technician confirms the ticket and the APP will show him the destination path to maintain.

The APP displays the reserved areas where the "Technician" is not authorized to access. Any violation of these areas will trigger an alarm.

When the technician arrives at the destination, brings the smartphone close to the TAG NFC positioned above the rack.
The APP reads the data from the TAG and opens a web page of rack "virtual image" that shows the information of the systems installed there and the server / system that needs maintenance.
The technician compares the server name on the "ticket" with the server name shown by the APP.
As soon as the technician finds the right machine, he sends an authorization to proceed through the APP. The Central Server Application recognizes maintenance and guarantees the "Business Continuity".
The technician receives the "START" signal on the APP and starts the maintenance activity.
At the end, the Technician confirms the "end of maintenance" with the APP.
The central server application receives the "end of maintenance" and sends a "WAIT" message through the APP to verify that all is going right.
A green light on the APP informs the technician that there are no problems and a 2D path shows the exit and where to return the smartphone.

C. Physical and Perimeter Safety

The same APP report to the Security Governance any violations of "restricted" areas not authorized for this intervention. A message will be sent to the APP in the event of such a violation.

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Challenges

Innovate and improve the quality and technical activity of the ordinary and extraordinary maintenance within the CED.

Main benefits of the project:

- Accuracy and effectiveness of maintenance oprations
- Increased productivity
- Rationalization of operation (organization) and asset management
- Accuracy of planning (procurement)
- Infrastructure reliability (overall availability)
- Greater compliance with safety standards

Solution

Description of the technology adopted

1. WEB application

2D display mode

The 2D visualization is obtained through the SVG (Scalable Vector Graphics) language which allows to visualize scalable images. You can select objects within the scene and display their properties within the sidebar.

3D display mode

The 3D visualization mode, obtained through Javascript code and Threejs open-source libraries, defines a 3D model of the Plugin. This definition, therefore, allows web representation during the 3D visualization of the scene. Through the interaction with the mouse it is possible to change the position of the environment and to see the scene from a different angle.

2. Mobile Application

The mobile APP is based on Android Web HTML5 encapsulated with the mobile development framework and Apache open source using web technologies like HTML5, CSS3 and JavaScript.

The APP interface is developed through the use of the Google Polymer web framework.

The indoor positioning is obtained via WiFi signal with fingerprint technique and K-NN (k-nearest neighbor) algorithm. A Kalman filter returns the final position through the integration of the smartphone IMU data and K-NN.

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3. IoT devices

Beacon BLE (Bluetooth Low Energy) have been installed both on racks and under the floating floor of the CED. These, integrated with an IoT Gateway, play a dual role:

- **Proximity**: by measuring the RSSI signal through a smartphone it is possible to obtain the distance from the Beacon BLE and therefore the proximity of the user from it or from a rack. The same function can also be performed by TAG NFC.

- **Sensors**: measure temperature, humidity and pressure below the floating floor where the rack cooling air circulates. A heat-map of the underfloor air has been obtained and the cooling air flow have been then analyzed.

References

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