Capstone Project: VMware#1-AR in Data Centers

Literature Survey

Group 21

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Maintenance in Data Center

Data centers (DCs) : requires reliability & availability

Systems to aid DC maintenance:

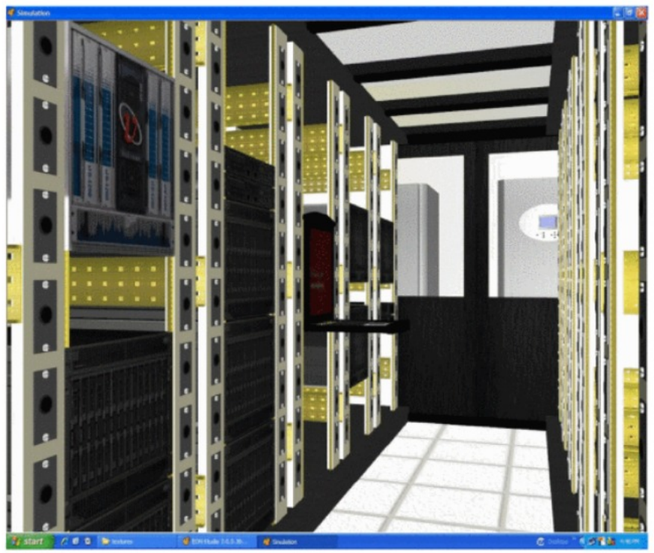
- Monitor and control the energy usage of IT devices
- Find component failures and provide repairing strategies

On-site operations:

- Fix the problematic devices manually inside DC

User-friendly Data Center Maintenance

- Database
  - Flowgate: helps enterprises integrate facility systems data and IT data to form a single holistic view of their operations.[8]
- Visualization



- Virtual Reality[4]

- Augumented Reality

- 3D Model and Augumented Reality [5]

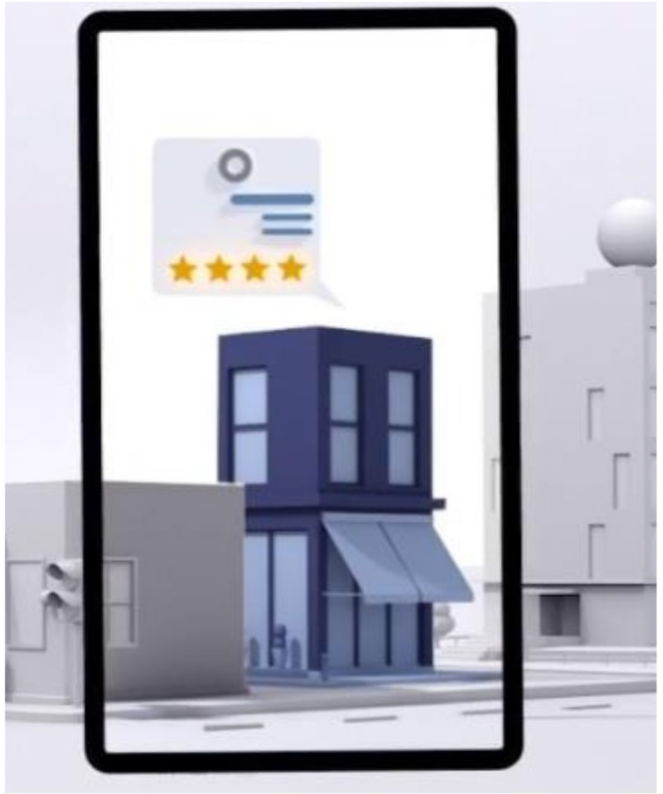
What is AR?

AR = Information Generated By Computers + Real-World Scenarios

- Hardware
  - sensors, processors, displays
- Software development kit
  - ARToolKit, Google ARCore, Apple ARKit, Maxst
- Platforms
  - iOS, Android, Windows and macOS
- Requirements
  - cost-effectiveness, data security, presentation accuracy, real-time capability

AR Applications in Industry

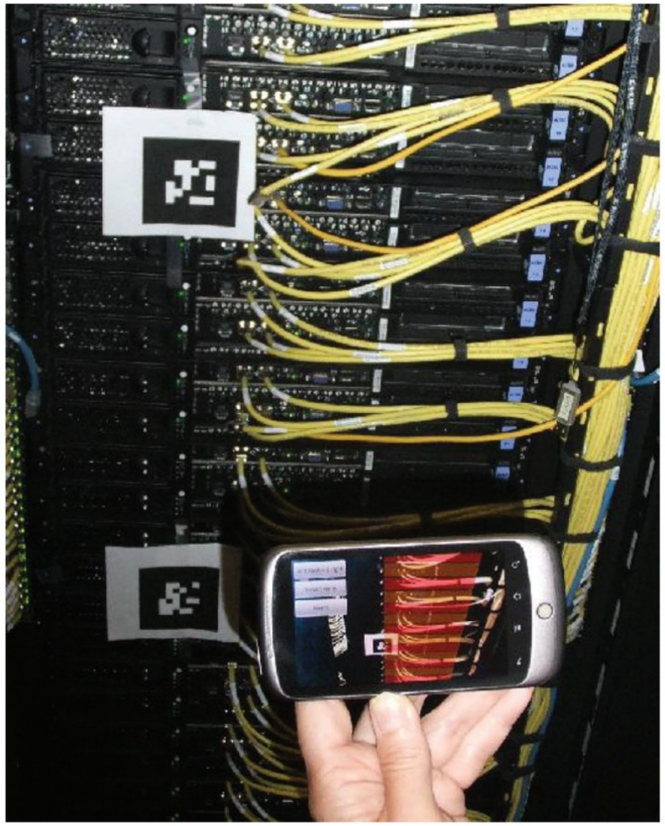
- AR instructions instead of traditional manuals
  - Synchronous
    - Advantage: avoid unnecessary site visits
    - Disadvantage: must have a remote expert on duty
  - Asynchronous
    - Advantage: provide different types of instructions with convenient access
    - Disadvantage: lack real-time help from experts



AR in Data Center

- Mobile augmented reality project
  - Enables system administrators to easily identify various hardware assets in data center;
  - Provide them with an additional tool to interact with hardware assets.

- Future Trend of the project
  - Applied to Robots;
  - Combined with 5G: compute 3D models directly from the cloud.



IBM's Mobile AR in Data Center Project

Search Methods

- Keywords / Search strategies:
  - Data center maintenance (Research Gate)
  - Flowgate (github)
  - Data Center Visualization (IEEE)
  - Augmented Reality (Google Scholar)
  - Collaborative AR (Google Scholar)
  - AR in Data Center (Google)
- Databases / Search engines:
  - IEEE
  - Google
  - Google Scholar
  - Github
  - Research Gate

References

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[2] H. Jalo, H. Pirkkalainen, O. Torro, H. Kärkkäinen, J. Puhto, and T. Kankaanpää, “How Can Collaborative Augmented Reality Support Operative Work in the Facility Management Industry?” KMIS, vol. 3, pp. 41-51, Sept. 2018, doi: 10.5220/0006889800410051

[3] S. Deffeyes, "Mobile augmented reality in the data center," IBM Journal of Research and Development, vol. 55, no. 5, pp. 5:1-5:5, Sept.-Oct. 2011, doi: 10.1147/JRD.2011.2163278.

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[5] https://www.inceptum.hr/data-center-operations-supported-by-augmented-reality/

[6] A. B. Craig, Ed., "Understanding Augmented Reality", San Francisco, Morgan Kaufmann, 2013.

[7] O. Quandt, B. Knoke, C. Gorldt, M. Freitag, K. Thoben, "General Requirements for Industrial Augmented Reality Applications," Procedia CIRP, vol. 72, pp. 1130-1135, 2018, doi: 10.1016/j.procir.2018.03.061.

[8] https://github.com/vmware/flowgate

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Thank you!