



Augmented Reality and its potential uses in Aircraft Maintenance

IMEKO

International Measurement Federation

Technical Subcommittee on **Augmented Reality**

ONLINE Virtual Mini-Seminar

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Agenda

What is Augmented Reality?

Some Market Devices

Positioning the digital world

Aircraft Maintenance Possibilities

Conclusions

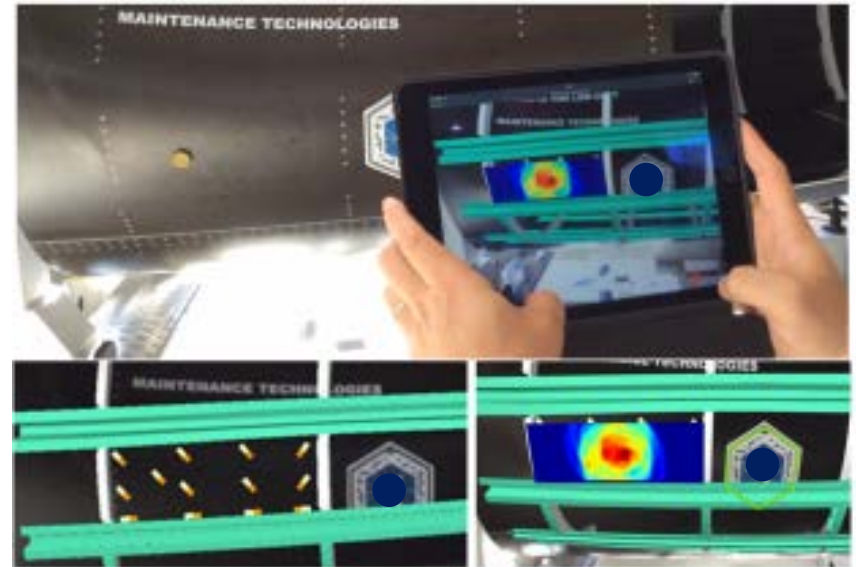


What is Augmented Reality?



Augmented Reality (AR) is the combination of the **physical real world** and the **virtual world** in **real time** with the user interaction.

The virtual information is **spatially rendered** in the physical world, usually using a tablet, smartphone, or augmented-reality glasses.



Source:

Prado, G. O. C., Silva, P. A., Simomura, F. M., & Pereira, K. L. O.
SHM WITH AUGMENTED REALITY FOR AIRCRAFT MAINTENANCE.
31th ICAS Congress 2018 - Belo Horizonte, Brazil

Augmented Reality (AR)



Digital content on top
of your real world.

Mixed Reality (MR)



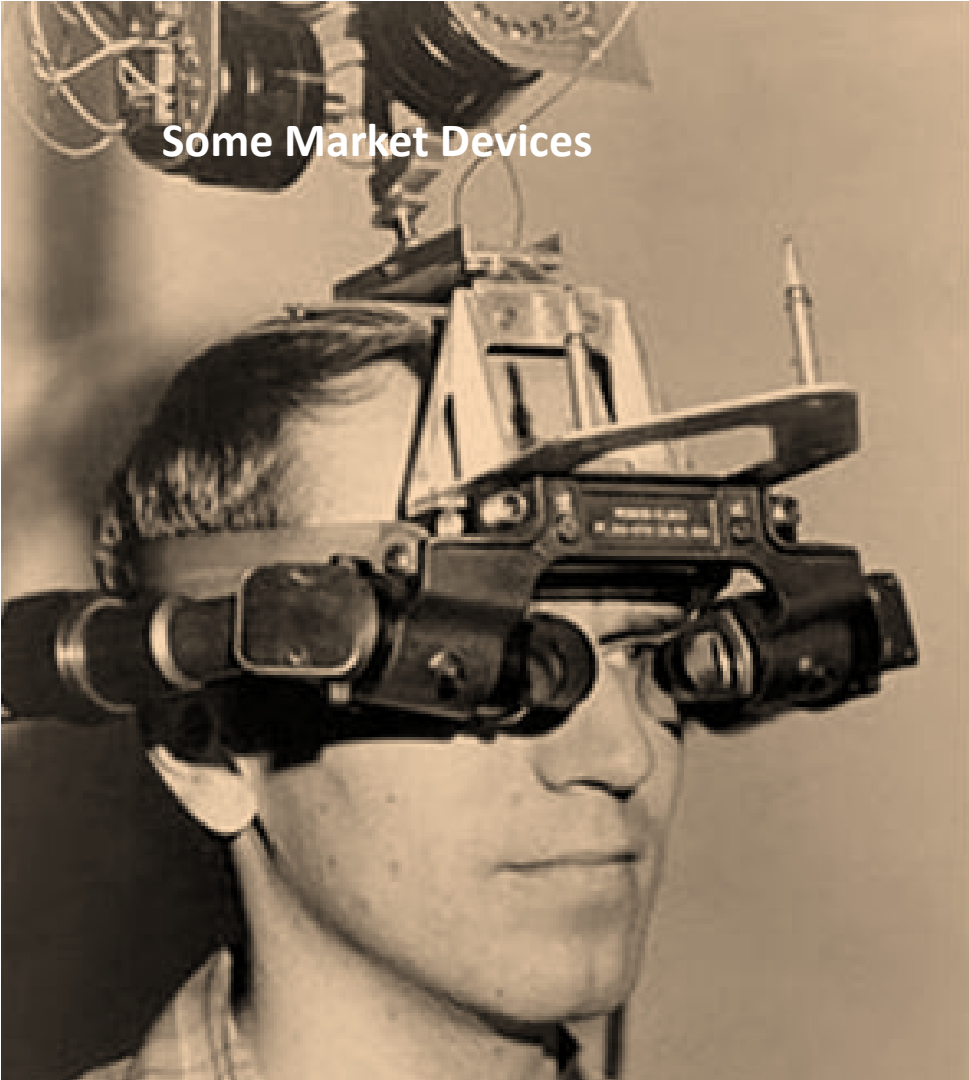
Digital content interacts
with your real world.

Virtual Reality (VR)



Digital environments
that shut out the real world.

Some Market Devices





HoloLens 2



Meta 2



Magic Leap



RealWear



Vuzix



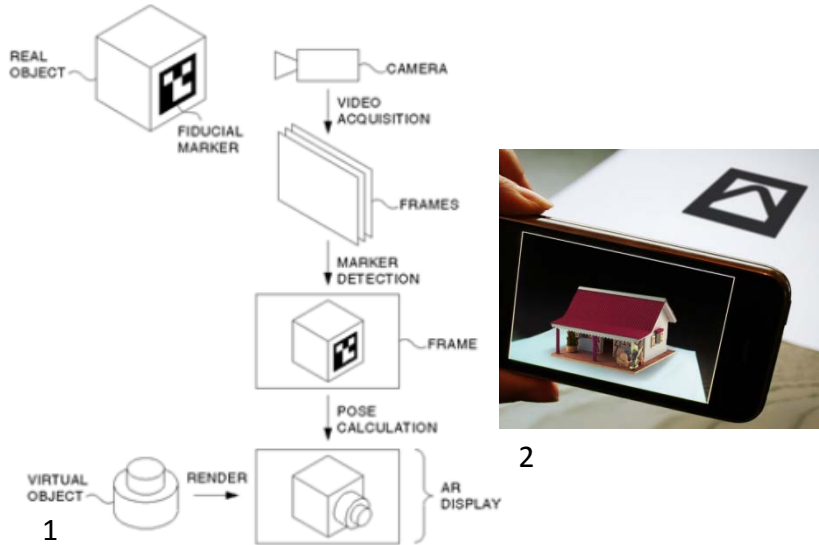
Tablets, iPads & Smartphones



Positioning the digital world



Marker-based



Markerless



Source:

1- Prado, G. O. C., Silva, P. A., Simomura, F. M., & Pereira, K. L. O. SHM WITH AUGMENTED REALITY FOR AIRCRAFT MAINTENANCE. 31th ICAS Congress 2018 - Belo Horizonte, Brazil

2- <https://thinkmobiles.com/blog/what-is-augmented-reality/>

3- <https://www.business2community.com/business-innovation/marker-based-vs-markerless-what-augmented-reality-type-is-right-for-your-business-02207722>



Aircraft Maintenance Possibilities



- Guide the user to an aircraft component
- View the maintenance activity step by step
- Remote Assistance with AR
- Guide to components in stock
- To display inputs and materials needed to perform the task
- Mechanic training
- “Paperless” environment
- *Extra: PH&ST*



Guide the user to an aircraft component

Technology for spatial recognition such as GPS, or IPS (Indoor Positioning System), associated with AR devices to **assist in the location of aircraft components**, in order to guide the user to a desired point on the aircraft and optimize the task execution time as a whole.



Off-line – Stand alone



View the maintenance activity step by step

With the information of the aircraft manual, the technology can support maintenance activities, **reducing errors** during the process and can also be used for training users.

Associated with Artificial Intelligence can be used to be the Quality team after the activity is performed to verify that the correct procedures have been performed.



Off-line – Stand alone with restrictions

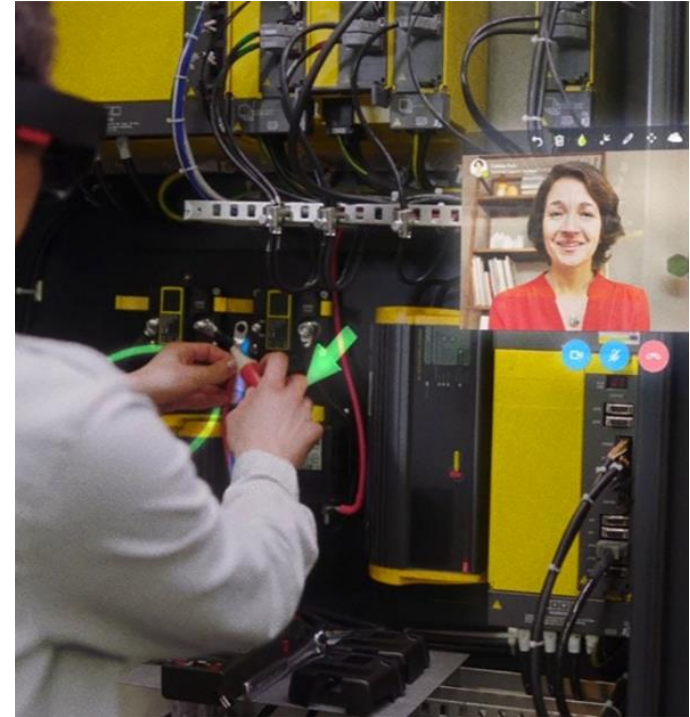


Remote Assistance with AR

Technology that makes it possible to carry out a video call between a **less experienced user** and an **expert on the subject**.

Possibility of having a **maintenance center** with specialists.

The AR is added in this context to assist in the display of doubts and solutions presented to solve the user's problem and can be presented through indicative arrows, flashing signs and texts positioned on the component that receives maintenance.



On-line

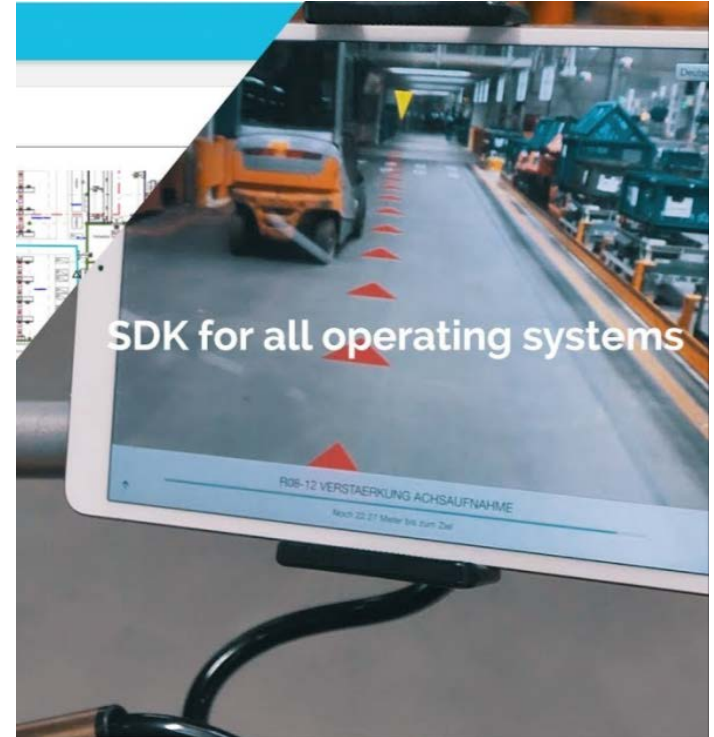


Guide to components in stock

The technology can be used **to guide the components in stock and speed up** the execution of the task.

It is necessary to know the correct position of the stored component.

A 3D “map” of the stock environment can be used for this positioning in space or GPS or IPS technologies.



Off-line – Stand alone with restrictions



To display inputs and materials needed to perform the task

The technology can be used to **display the necessary inputs to perform the task**, so that when the user is going to perform the task he already has all the necessary material.



Off-line – Stand alone with restrictions

Mechanic training

It can be used for training in order to train not only the steps of executing a task, but also to bring the **experience of motor training to the user.**

Reduced cost for training.

Ease of implementing new modules: repair, component replacement, activity in the cockpit and troubleshooting.



Off-line – Stand alone



“Paperless” environment

By guaranteeing access to **up-to-date information**, transferring data in a safe and reliable way, you can **eliminate printed papers**, job logs in stamp and handwritten format, helping to improve the **ecological environment**.



PH&ST

(Package, Handling, Storage and Transportation)

Storage: Keep in the case kit available in the warehouse area to avoid damage.

Maintenance: Simple maintenance on the glasses is performed by the warehouse maintainer: lens change, cleaning by the user, battery charge, updates, etc.

Transport: When moving from one environment to another, if in maintenance activity, keep the glasses on your face, otherwise keep it inside the case.

Availability: Training: always be at the training site.



Conclusions



NASA Orion Spacecraft

(<https://www.technologyreview.com/2018/10/09/103962/nasa-is-using-hololens-ar-headsets-to-build-its-new-spacecraft-faster/>)

- There is **great potential** for using technology due to **its benefits**.
- Studies show a loss of maintenance capacity due to **employee turnover** and an **aging specialized workforce** that AR technology can help.
- There is still a need **to integrate** information from maintenance management systems with these new technologies.
- The production of **content for use in VR / AR is evolving** a lot.
- Adequacy of the rendering of the 3D models to the capacity of the AR device with sufficient **quality and latency to perform** the tasks without harming the user.





Thank you!

Questions?