



## Experiences with AR and AI in development projects

By: Sune Wolff, CTO & Partner at Unity Studios

### Agenda



1	Introduction
2	Today's and Tomorrow's AR Technologies
3	AR and AI: Mutually Beneficial Technologies
4	Presentation of Cases and Experiences with AR and AI

**Who am I?**  
Introduction and background



**SUNE WOLFF**  
CTO & Partner at Unity Studios

Specialist in Virtual Reality, Augmented Reality, Mixed Reality.

Using cutting edge technologies to help companies in their digital transformation, getting the most out of the possibilities Industry 4.0 can bring them.

Postdoc. Model-based Algorithm Development  
PhD. Modelling and Simulation of Cyber Physical Systems  
MSc. Engineer - Technical IT  
BSc. Engineer - Electronics and IT

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ABOUT UNITY STUDIOS  
**Who are we?**  
Introduction and background



 <p>VR, AR &amp; MR DEVELOPMENT &amp; CONSULTING</p>	 <p>OFFICE LOCATED IN AARHUS, DENMARK</p>	 <p>ALL SOLUTIONS BUILD IN UNITY 3D</p>	 <p>SUPPORT +35 PLATFORMS</p>	 <p>+120 SUCCESSFULL PROJECTS</p>	 <p>PROJECTS IN +20 COUNTRIES</p>
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ABOUT UNITY STUDIOS

**Who are we?**

Introduction and background

**PIONEERS**

Unity Studios have explored and worked with interactive 3D since January 2008.

We have worked with VR/AR since 2011.

Founded by the founders of **Unity Technologies** makes Unity Studios one of the first 3D-studio in the world to utilize the Unity engine.

**BUSINESS MODEL**

We are a technology consulting and software development company.

We have a clear focused vision – we want to bridge the virtual and the real world for our national and global B2B clients and partners.

**BUSINESS ACUMEN**

We make solutions that moves businesses – we strive to create business-value by combining cutting edge technologies with business understanding.



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... and many more!

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## Today's and Tomorrow's AR Technologies Technology Overview



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## Today's and Tomorrow's AR Technologies

### Marker-based AR



#### Marker-based AR

- E.g. Vuforia
- Pre-train algorithm to recognize feature points in image
- Superimposes virtual content on camera feed
- Cloud recognition
- Model target

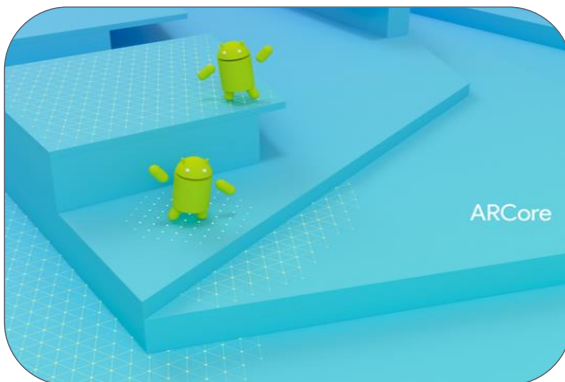
#### Pros and Cons

- Always aligned with the marker
- Alignment with real-world is easy
- Does not work without the specific marker
- Limited use cases

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## Today's and Tomorrow's AR Technologies

### Marker-less AR



#### Marker-less AR

- E.g. ARKit and ARCore
- Analyses the camera input to map the surroundings and places the user in them (SLAM)
- Fusing sensory input from camera and IMU

#### Pros and Cons

- Early versions only detected horizontal planes
- Now also detects non-horizontal irregular geometry
- Needs feature-rich surroundings to work well
- Tracking drifts over distances over a few meters
- For mobile devices
  - Large potential userbase
  - Not hands-free

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## Today's and Tomorrow's AR Technologies

### AR Glasses



#### AR Glasses

- E.g. Mira Prism
- Mirrors iPhone screen on reflective see-through screen
- Rotational tracking from iPhone IMU
- 3DoF controller
- Preferred EU partner

#### Pros and Cons

- Simple and cheap
- Based on iPhone
- No spatial awareness

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## Today's and Tomorrow's AR Technologies

### MR Glasses



#### MR Glasses

- E.g. Microsoft HoloLens
- Actively scanning sensors creates mesh of surroundings
- Separate processor for mesh generation (HPU) and application (CPU)

#### Pros and Cons

- Unparalleled spatial awareness and tracking
- Untethered device
- Full connectivity
- Ageing hardware

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## Today's and Tomorrow's AR Technologies

### AR/MR Paradigm Shift



#### AR/MR Paradigm shift

- Earlier: need of active scanning devices like depth sensors
- Now: data analysis of camera feed
- Example:
  - ARKit/ARCore spatial understanding
- Enables Mixed-Reality experiences on AR devices

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## Today's and Tomorrow's AR Technologies

### The "AR Cloud"



#### AR Cloud

- Data is streamed to the cloud for persistence
- Virtual augmentations are persisted
- Allows for persistent content, occlusion and real-time shared experiences
- Several implementations
  - Google Cloud Anchors
  - Placernote
  - 6d.ai

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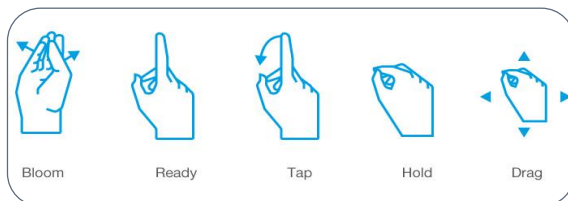


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## AR and AI: Mutually Beneficial Technologies

AR/MR Limitations



### Interactions

- E.g. Microsoft HoloLens gestures
- "Air Tap" imitates mouse click
- Contextual interfaces are needed
  - Keyboard for typing
  - Bounding box for moving, rotating and resizing
  - Etc
- Relatively slow
  - E.g. typing is not recommended
  - Meta 2 "Neural Interface" not much better
- Limits the users expressiveness

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## AR and AI: Mutually Beneficial Technologies

AI Can Improve AR/MR



### Speech Recognition

- Voice commands
  - Algorithm listens for certain commands
- Speech To Text (STT)
  - Record voice and parse into textual format
- Text To Speech (TTS)
  - Synthetic voice reading text for the user
- Natural Language Processing (NLP)
  - For intent extraction
  - More natural interaction with e.g. Chatbot

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## AR and AI: Mutually Beneficial Technologies

AI Can Improve AR/MR



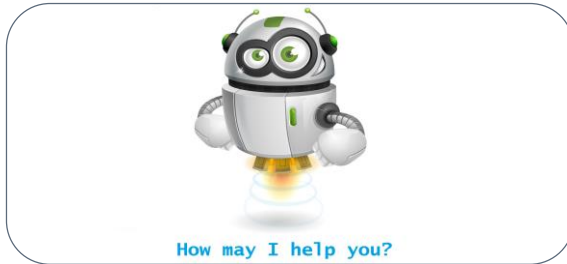
### Computer Vision

- Optical Character Recognition (OCR)
  - Avoid users typing input
- Image classification
  - Automatically identify objects the user sees
- Face recognition
  - Recognize facial expressions, age, mood, etc

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## AR and AI: Mutually Beneficial Technologies

AI Can Improve AR/MR



### Chatbot

- E.g. Cortana, Siri or Google AI Assistant
  - Google Duplex from last weeks Google I/O 2018
- Troubleshooting
- Help user search data

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CASE PRESENTATION

**Grundfos – Visualization of data**  
Upgrading the service-force with real-time data



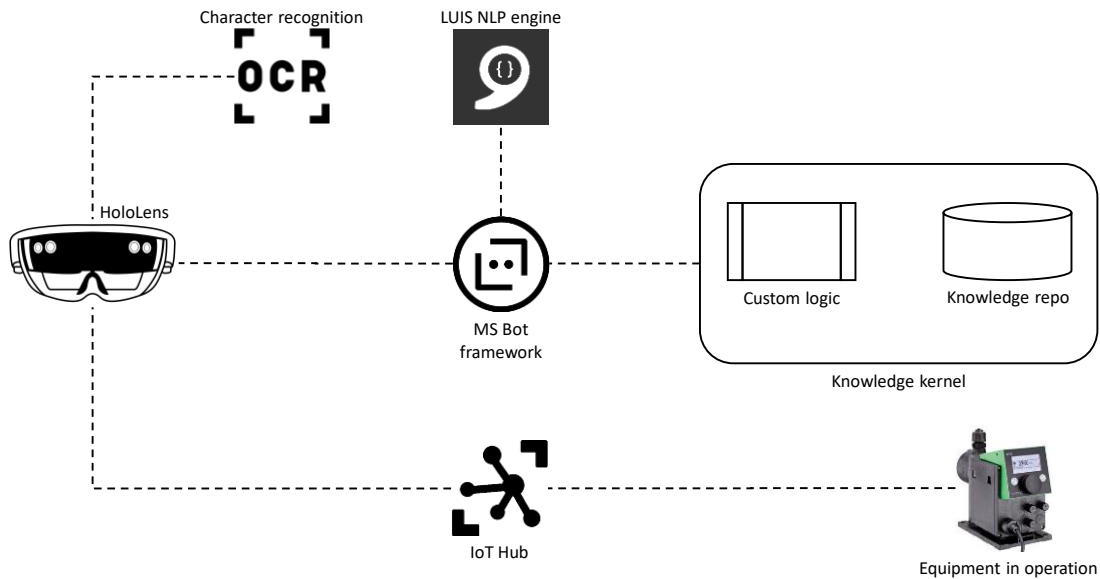
**The Challenge**

- How can the Microsoft HoloLens be utilized to obtain real-time data from pump-installations?
  - Presented in a relevant place
- How to combine data with various materials and models into the field?
- How to use AI to improve the user experience?
  - Login
  - Troubleshooting
  - Etc.

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CASE PRESENTATION

**Grundfos – Visualization of data**  
Upgrading the service-force with real-time data



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CASE PRESENTATION

## Grundfos – Visualization of data

Upgrading the service-force with real-time data



### The Solution

- Retrieve data from IoT Hub
- Retrieve data Grundfos Product Center
  - Data sheets, pump curves etc
- OCR for nameplate scanning
- Microsoft Chatbot for troubleshooting
  - LUIS NLP for more robustness
- Graph database to structure knowledge

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# UNITY STUDIOS

3D EXPERIENCES

## Thank you for your attention!



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