Wednesday, November 20

**Day One**

**Session Code:** ARVR1

**Room Vaihinger Saal 5**

**Session Time:**

<table>
<thead>
<tr>
<th>Time</th>
<th>Paper No.</th>
<th>Title</th>
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<tbody>
<tr>
<td>8:30 a.m.</td>
<td>ORAL ONLY</td>
<td><strong>Keynote Address: Breaking Through Barriers to AR in Large Enterprise</strong></td>
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<td>Enterprises seeking to maximize their return on AR investment have requirements that are worlds apart from those of consumers. Businesses need to rely on accurate data, highly consistent results, precise tracking and deep analytics. They need to be able to use and re-use existing media assets, provide choices to their user communities and drive innovation in the use of AR.</td>
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<td>Christine Perey, PEREY Research &amp; Consulting</td>
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<td>9:00 a.m.</td>
<td>ORAL ONLY</td>
<td><strong>Augmented Reality insertion into Product Development and Assembly &amp; Integration at Boeing</strong></td>
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<td>We will provide a synopsis of various Augmented and Virtual reality technologies currently under development in Boeing Research &amp; Technology, and our vision of where these technologies fit into the product life cycle at Boeing. We will also give a technical overview of an Augmented Reality system developed by Boeing, the status of its implementation, and a snapshot of the business justification of using advanced visualization techniques in Assembly &amp; Integration.</td>
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<td>Paul Robert Davies, Lorrie J. Sivich, Boeing</td>
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<td>10:00 a.m.</td>
<td>ORAL ONLY</td>
<td><strong>Value Proposition for implementing Virtual Reality and Lessons Learned at EADS</strong></td>
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<td>In this presentation, EADS experts will present how Virtual Reality (VR) has been introduced to support engineering and manufacturing processes. Typical uses cases will be detailed and added values described. The talk will also address the management of digital mockups (DMU) and preparation phase needed to fit data with VR systems. The technical issues and limitations both on software and hardware will also be exposed.</td>
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<td>Nicolas Chevassus, Francois Guillaume, EADS France</td>
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<td>10:30 a.m.</td>
<td>ORAL ONLY</td>
<td><strong>Perceptions in Immersive Engineering: The Value of Subjectivity and The Customer’s Perspective</strong></td>
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<td>Elizabeth S. Baron, Ford Motor Co.</td>
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<td>11:00 a.m.</td>
<td>ORAL ONLY</td>
<td><strong>Early Valuations of AR in Low Volume, High-Variability Production</strong></td>
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<td>Quantifying the value of augmented reality as a production tool is a challenging problem. Academic research and early commercial information release is typically focused on high volume, low variability production use cases. Manufacturing needs that include high variability projects pose additional challenges to establishing the net present value of AR - but include high potentials for positive cost and schedule impacts. This discussion will reveal some early results in establishing AR as a successful tool in a shipbuilding scenario, and highlight some of the challenges faced as mobile solutions were taken from bench top pilots to large scale.</td>
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<td>Patrick J. Ryan, Newport News Shipbuilding</td>
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11:30 a.m. ORAL ONLY Virtual and Augmented Reality: Status quo at Volkswagen Group
The Volkswagen Group makes use of Virtual Technologies along the whole product life cycle. Technologies like CAx, simulation or Digital Factory are established and in daily use. Current efforts lay in use of Virtual and Augmented Reality in development, production and after market applications. Selected application examples and lessons learned will be discussed.
Werner Schreiber, Volkswagen AG

1:30 p.m. ORAL ONLY Industrial Augmented Reality
Growing competitive constraints in industrial production result in a rising product complexity, in a large amount of product variants and in abbreviated development cycles. This complexity interferes with the maintenance strategy that has to support overhauling and error recognition with maximal efficiency. The required knowledge density can only partially be supported by digitalization, also a high-efficient man-machine interface is required guiding the service technician in awareness of complex situations though difficult procedures. Thereby, the required mobility of the service technician that often has to move in large industrial areas has to be assured.
Uli Bockholt, Fraunhofer-IGD

2:00 p.m. ORAL ONLY Virtually Designed
This presentation will focus on how we used VR to develop the evoque and how we are developing and using VR and advanced visualization for the future.
Brian Waterfield, Jaguar Land Rover

2:30 p.m. ORAL ONLY Cost Reduction Through Augmented and Virtual Reality
This presentation focuses on the use and applications of augmented reality and virtual reality in a manufacturing environment. There are a few areas within manufacturing where these technologies have been used already and there are many where potential efficiency or quality savings have created an interest or drive to their further use. This paper tries to assess these known applications as well as other possible applications for such technologies, the major advantages and disadvantages and the level of development necessary to really generate the benefits to manufacturing efficiency. The work has mainly focused on aerospace and other transport industries but the challenges these industries face are often very similar to those of other industries and the solution is transposable. Various hardware setups have been considered for example in VR what are the advantages of a fully immersive environment over a 3D screen or even a tablet? Examples of AR and VR are discussed and the benefits identified.
Rab Scott, Jim Heley, AMRC with Boeing

3:30 p.m. Panel Quantifying and Communicating the Business Value of AR/VR
It takes more than an engineering report and slide presentation to move new technology beyond a pilot or proof of concept project. To discuss with stakeholders and to obtain their support for expansion and possible changes in processes requires metrics and several parallel communication strategies. During this discussion panelists will share how they have sought to measure the potential value of their projects, how and when they translate pilot results into impacts for the business and the approaches they’ve used or plan to use to engage with different business groups.

Moderators - Christine Perey, PEREY Research & Consulting
Panelists - Elizabeth S. Baron, Ford Motor Co.; Jim Heley, AMRC with Boeing; Christian Matzen; Patrick J. Ryan, Newport News Shipbuilding; Ryan Wheeler, Rockwell Collins Inc.;
Augmented and virtual reality present a range of challenges when seeking to translate these technologies to effective educational and training tools. Game-based learning has been shown to enhance a learning in a wide range of areas, and its particular relevance to the manufacturing sector will be discussed, giving insight to the benefits and challenges when implementing game-based solutions.

In this keynote, experience from projects at the Serious Games Institute will be presented, with a range of topics discussed including how to effectively balance educational and entertainment aspects, how to best structure projects seeking to create effective serious games in the area, and approaches for validation and assessment of efficacy. The topics presented will be relevant to the wide range of stakeholders involved in the serious game development process, ranging from educational theorists and technical developers, through to trainers and end-users.

Ian Dunwell, The Serious Games Institute

A virtual reality application must address many different issues regarding:
- devices management: writing drivers, converting coordinate systems,
- display management: creating the correct perspective and stereoscopy,
- cluster management: synchronizing the different screens,
- development and deployment: creating interactions and moving the application from one VR system to another.

Sebastien Kuntz, I'm in VR

Cost and function are barriers to entry that keep subcontractors from the benefits of advanced visualization technologies. This session will highlight the shifted needs and value proposition of AR/VR that exist for the subcontractor, and it will overview how Rockwell Collins has taken a "Do It Yourself" approach to accomplish agile and affordable AR, VR, and Interactive Desktop Visualization with broad adoption.

Ryan Wheeler, Rockwell Collins Inc.

Augmented reality provides the potential for information delivery and capture at the point of need or activity, with the opportunity for increased individual and operational effectiveness, improved organizational performance, and more timely and relevant decision-making. While the potential benefits of AR to the enterprise are significant, the cost and time to create the AR content and experience has been a significant barrier to adoption.

Carl Byers, NGRAIN

Hybrid Prototypes, Interactive Simulation and Visualization in VR/AR

Martin Aumüller, High Performance Computing Centre

Hands-Free Mobile Computing - So what's the big deal?

Jeffrey Jacobsen, Kopin Corporation
1:30 p.m.  ORAL ONLY  Smart Glasses on the Floor
With the advancement and commoditization of mobile system-on-chips, sensors, and small form factor cameras, smart glasses are rapidly attaining the size, cost, and widespread availability required to address a multitude of use cases in consumer and industrial applications. In particular, smart glasses are an emerging platform upon which heads-up hands-free augmented reality applications may be built to drive incredible user value. Such applications can fundamentally impact how businesses operate on a daily basis, often simplifying workflows and reducing errors. These smart glasses are especially powerful in businesses that employ a large mobile workforce not typically assigned to desks, such as those in automotive and manufacturing industries.

Brian Ballard, APX Labs

2:00 p.m.  ORAL ONLY  From Hollywood to the Factory Floor - Large Volume High Precision AR
We will take a look under the hood of some of Hollywood's biggest blockbusters to see how camera tracking, and AR/VR play a part in stunning audiences worldwide. The breakthrough technology that Take4D has developed combines laser tracking, LiDAR, and real time image generation are now available to the aerospace, manufacture and construction industries.

Richard Widgery, Take4D

2:30 p.m.  ORAL ONLY  SAE International Working Group to Develop a Recommended Practice Document on Graphics - Based Service Information (J2892)
Translating Service Information into human natural languages is expensive for multi-national firms. Some businesses reduce that expense through using extensive graphics in their service procedure documentation. Before J2892 every firm following this approach used graphics and symbols in their own, proprietary way; increasing training time and expense for new hires and causing many technicians to learn several approaches. SAE’s J2892 should help firms maintain consistent understanding of their stories and reduce training via one, universal set of symbols and conventions.

Arnold Taube, John Deere World Headquarters

3:00 p.m.  Panel  Current and Future State of AR/VR Technologies
The discussion will be centered on system components that are available today and ready to be implemented, as well as gaps that must be bridged before a production implementation can be achieved. The panel will also address barriers that currently exist, preventing or inhibiting some use cases of AR/VR and will consider how these might be overcome, leading to a discussion on the vision of where AR/VR technologies are headed in the future.

Moderators - Lorrie J. Sivich, Boeing
Panelists - Brian Ballard, APX Labs; Paul Robert Davies, Boeing; Jerome Perret, Haption; Jean-Baptiste Riviere;