

# DIEM – Mobile Mixed Reality

Ruoholahti

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Nokia Research Center

27 August, 2008

First Name Last Name | NRC © 2007

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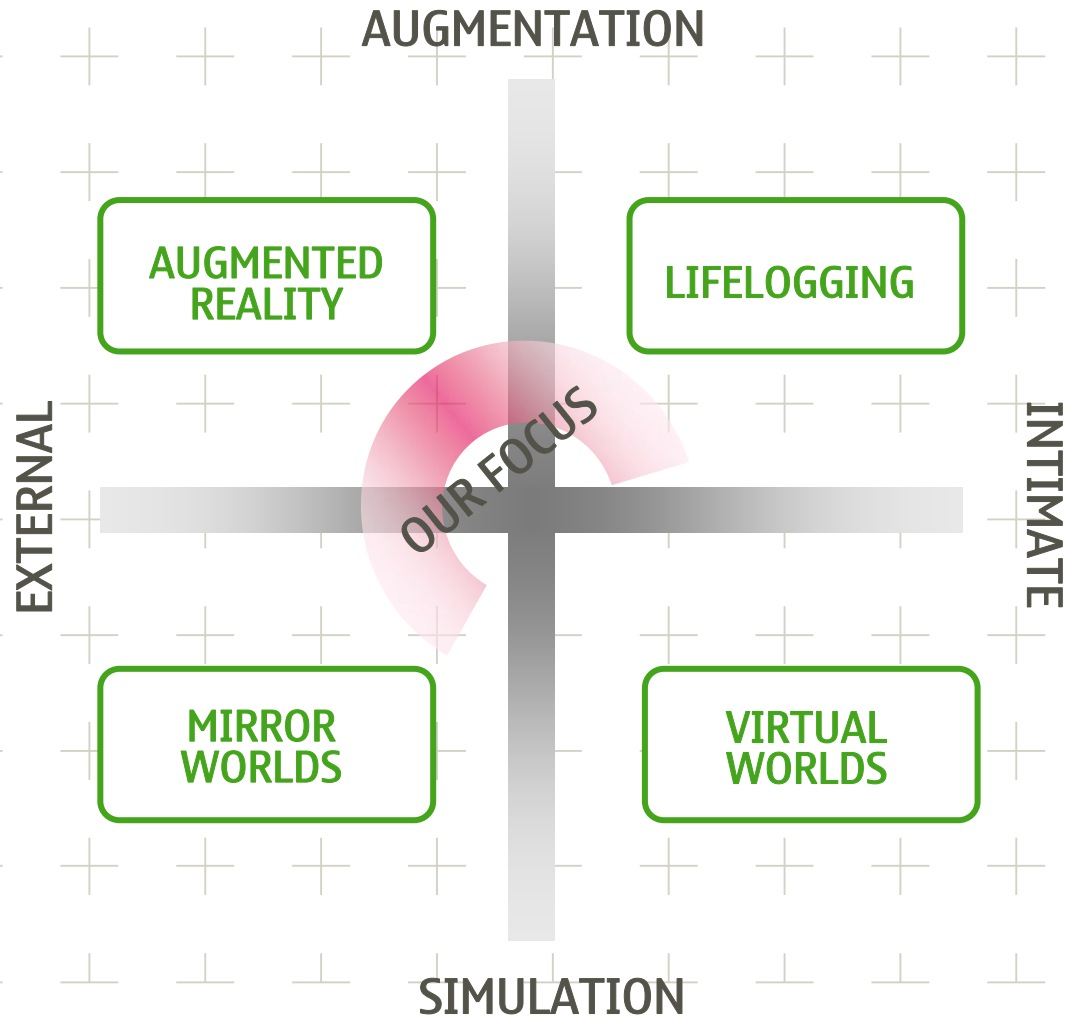
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# Abstract & Mission

- This project will develop algorithms, methods and service applications to pilot user- and community-created, mixed reality content and context-dependent search and presentation of content and information, particularly with the means of augmented reality. Here, content and information associated to physical places, objects and situations can be accessed and then aligned with the real environment for display. Hence, the project builds new kinds of contextual interfaces to media and information.
- Project's mission may be summarized to enable physical locations to become knowledge hubs, combining physical context with social networking and aggregated content.



# Mixed Reality – Research Focus



# Statistics & Partners

- Two-years project: 1<sup>st</sup> of June 2008 – 30<sup>th</sup> of June 2010

PARTNERS	1 <sup>st</sup> Year	2 <sup>nd</sup> Year	TOTAL
Nokia Research Center	88	95	183
Sesca Mobile Software	18	18	36
TKK/Adaptive Informatics Research Centre (AIRC)	22	22	44
TKK/Department of Media Technology (MT)	22	22	44
TUT/Human-Centered Technology (IHTE)	22	22	44
VTT/Virtual Models and Interfaces & Knowledge Systems units	33	33	66
<b>TOTAL</b>	<b>205</b>	<b>212</b>	<b>417 *)</b>

\*) In addition, the DIEM “UI & Interaction” horizontal WP (UTA) participates in the UI and interaction design of MMR services



Discussion with Fjord about their participation on-going  
Nokia Research Center

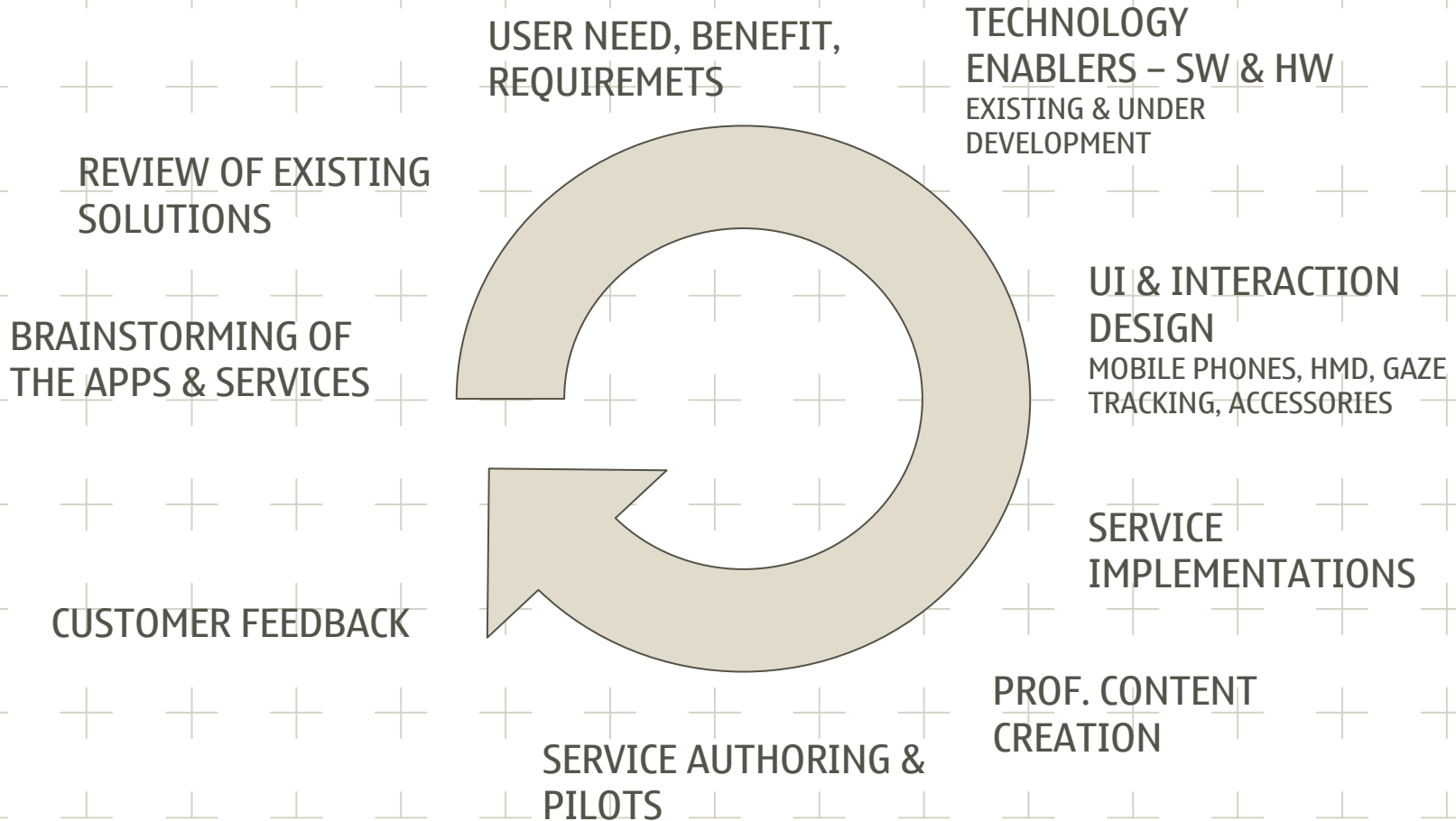
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# Work Packages

- **WP1: Enabling Technologies (93.5 PM)**
  - NRC, TKK (AIRC), TKK (MT), VTT
- **WP2: Application Development (47 PM)**
  - NRC, VTT, TKK (AIRC), Sesca
- **WP3: User-Centric Design and Evaluation (22 PM)**
  - NRC, TUT (IHTE), (UTA)
- **WP4: Service Pilots (19.5 PM)**
  - NRC, TUT (IHTE), VTT



# Integrated Approach...



# WP1: Enabling Technologies

- Activity 1.1: Geometry- and Lighting-Aligned Visual Display
- Activity 1.2: Interaction Design and Gesture Recognition for Synchronized Input
- Activity 1.3: Proactive Information Search Based on User Data
- Activity 1.4: Contextual Multimodal Relevance Feedback
- Activity 1.5: Near-to-Eye Display with Gaze-Tracking and Virtual See-Through



# WP2: Application Development

- Activity 2.1: Integration of Algorithms to System Solutions
  - Mobile user interfaces, interaction, wireless solutions
  - Migration of PC solutions to Symbian and other mobile platforms
- Activity 2.2: Development of Showcase Applications & Services
  - Framework for ubiquitous, context-based, personalized information retrieval
  - Considering both indoors/outdoors augmentation, emphasis on markerless tracking, unprepared environments
- Activity 2.3: Development Tools for User-Created Mixed reality content
  - Augmented blogging, “GeoStickers”, e.g., videos, photos, messages tied to physical locations
  - Digital graffiti, artwork, created, e.g., by gesture-based interaction using camera phones



# WP3: User-Centric Design and Evaluation

- Activity 3.1: Early Phase Usability Requirements of Multimodal AR
  - Considering both input and output modalities
  - Individual and social requirements
  - Acceptance factors and design guidelines for applications
- Activity 3.2: Usability Evaluations of AR Applications
  - Laboratory and contextual tests with target users
  - Iterative approach for early design guidance
- Activity 3.3: Perceptual Studies of Audio-Visual Quality and Perceptual Factors
  - Quantitative and qualitative research of user acceptance



# WP4: Service Pilots

- Activity 4.1: Service Authoring
  - Nokia Alpha & Beta Labs
  - Ubiquitous Helsinki
- Activity 4.2: Professional Content and Facilitation of UGC for Service Pilots
  - Sustainable environment: Environment history & prognosis, etc
- Activity 4.3: Feedback Analysis and Reporting
  - Analysis of service/feature usage based on log data



# Expected Deliverables

- Enhanced marker-based tracking library
- Prototype of markerless tracking. Prototype of lighting aligned rendering
- Near-to-eye display with gaze-tracking and virtual see-through
- Gesture recognition library
- Context logger for dynamic, real-time user data aggregation
- Proactive and contextual information retrieval methods
- Prototype of relevance and multimodal relevance feedback systems
- Adapting and developing MMR solutions to mobile platform; report and solutions
- Generic tools for mobile user interface and interaction, report and solutions
- Mobile AR tracking toolbox on Symbian
- Test bed system for MMR applications
- First iteration of general-purpose application prototypes for usability evaluations
- Second iteration of selected application prototypes, for piloting in Public Spaces smart environments
- Prototype systems for AR visualization and MR content retrieval, in two iterations
- Tools for MMR content creation, e.g. “Digital Graffiti” and “GeoStickers”
- Prototype system for MMR blogging, supporting personalized creation and sharing of multiple media
- Early user requirements, design guidelines and concepts for MMR services/applications and user interfaces.
- Further elaborated design guidelines and concepts, reports from quantitative and qualitative user studies of the developed applications and services.
- Research reports of test measurements and design implications for the perceptual factors in the designed MMR technologies and applications/services.
- Service pilot application for a limited test audience and another application for public audiences
- Professional content and facilitation of user-created content for the service pilot applications
- Feedback analysis requirements and report planning
- Report/analysis of the service pilot applications

