



Software Components for Serious Game Development

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Starting points

- Applied games (serious games) are useful
 - Societal problems, health, education/training
 - Driving creativity and innovation
 - Creating jobs
- Applied games are typically "low budget, low tech" ("poor cousins" of the leisure game industry)
- Applied game industry is highly fragmented
 - >3000 small companies across Europe;
 - no key players
 - Limited knowledge sharing
 - Plenty of re-inventing the wheel



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The RAGE project

- H2020 Research and Innovation Action in advanced gaming technologies (ICT-21)
- Partners from
 - Games Industry
 - Research
 - Education and Training
 - Business Innovation



➔ To support (serious) game studios with new technologies ➔

Making available advanced game technology components to develop Applied Games easier, faster and more cost-effectively.

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RAGE reusable game software components



1 Data analysis

- Data capturing
- Sensors
- Emotion detection
- Competences
- Learning analytics
- Assessment
- Evaluation

2 Game intelligence

- Social agents
- Natural language
- Dialogues
- Game balancing
- Storytelling
- Procedural animation
- Gamification

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What new technologies?



WP3 User data analysis	WP3 Strategic and Social Agency
Server-Side Interaction Storage and Analytics	Emotional Appraisal
Step-based competence assessment	Emotional Decision Making
Readiness - Self-rated Analysis on Teams	Social Inference Dynamics
Authenticity & Attribution	Virtual Human Controller
Server-side Identification and Analysis	Role-imp. Judgement
Game Storage - Server-Side	Integrated Authoring Tool
Client Tracker	Readiness - Semantic Models and Topic Mining
Dynam Model Asset	Readiness - Automated Essay Grading
Competence Assessment Asset	Readiness - Automated Assessment of Participation and Collaboration in CSCW Conversations
Motivation Assessment Asset	Readiness - Automated Identification of Reading Strategies
Real-Time Arousal Detection Using Galvanic Skin Response	Communication Systems Editor
Game Storage - Client-Side	Speech I/O
Client-Side Real-Time Emotion Recognition	Adaptation and Assessment (Dyna) Asset
	Competence-based Adaptation Asset
	Manipulation-based Adaptation Asset
	Player Profiling Asset
	Cognitive Interaction Asset
	Player Center Rule and Pattern-Based Adaptation
	Social Classification Assets (SUGAR)

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Rageproject.eu



Asset name	Short description	More details
1 Server-side interaction storage and analytics	Enables to store server-side interaction data (e.g. user actions and game events) for analysis and reporting.	View
2 Step-based competence assessment	Enables to assess user competence at different levels of the game.	View
3 Readiness - Self-rated Analysis on Teams	Enables to assess user readiness for team-based activities.	View
4 Authenticity & Attribution	Enables to assess user authenticity and attribution of actions.	View
5 Game Storage - Server-Side	Enables to store game data on the server.	View

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Coping with technological diversity

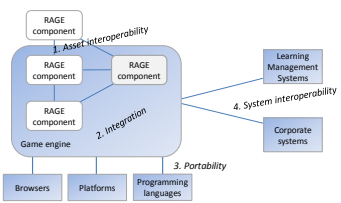


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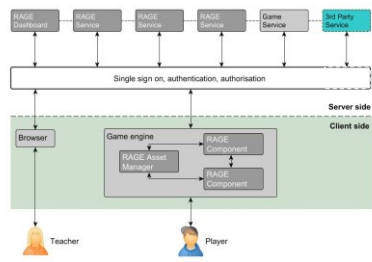
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Portability/Interoperability

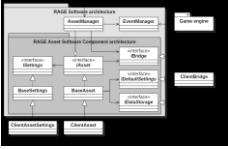


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RAGE Client-asset architecture



- Avoids dependencies of external software frameworks/libraries
- Based on established software patterns and abstraction
- Avoids any interference with the user-interface
- Principal client-side code bases: C# and TypeScript

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Examples

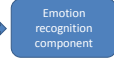
- Emotion recognition
- Natural language processing
- Performance statistics
- ...

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Example 1: Real-time emotion recognition



Webcam stream



- Happiness
- Sadness
- Angriness
- Disgust
- Surprise
- Fear
- Neutral

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Example 1: Real-time emotion recognition

1. Face detection
2. Facial landmarks (37-64 points)
3. Emotion extraction
 - training data set
 - fuzzy logic rules
 - accuracy ~80%

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Example 1: Real-time emotion recognition



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Communication training



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Job seekers interview training



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Example 2: Natural language processing

- I cannot speak English
- I can speak English
- I can speak Dutch



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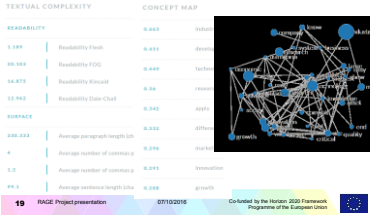
Example 2: Natural language processing

- RAGE readerbench services (RESTful)
 - Textual cohesion
 - Textual complexity
 - Semantic annotation
 - Sentiment analysis / opinion mining
 - Essay grading
 - Conversation analysis
- Readerbench.com (English, French) → ...Dutch



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Example 2: Natural language processing



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IT ALERT



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Example 3: performance statistics



Exploiting the players data trails:

- Which data to select?
- Which statistical procedures to use?
- How to apply and interpret the statistics?

Performance indicators:

- Task completion time
- Task performance quality

Performance statistics component

- Population statistics
- Normality check
- F-test/T-test comparisons

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Example 3: performance statistics



- Goal:
 - provide teachers with reliable statistics on student performance in serious games and protect teachers against making interpretation mistakes
- Approach:
 - Send student scores from a client side game to a server-side analytics system
 - Compare student scores to group scores
 - Present visualizations of performance when requested by the teacher
- Interpretation:
 - Include interpretation info and possibly a warning for misinterpretations

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Example performance visualization

