


## Progetti disponibili

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## Cognitive deterioration


Una delle sfide attuali è quella di monitorare il declino cognitivo di una persona anziana sola, a partire dalle loro attività quotidiane.


Abbiamo sviluppato una piattaforma per consentire a gruppi di persone di fare attività' assieme e nello stesso tempo comunicare in video-chat.

Raccogliamo i dati delle singole mosse associate alle diverse attività (giochi di carte, puzzle, ruzzle...), in questo progetto vogliamo ricavare un profilo di abilità cognitiva a partire dall'analisi di questi dati, sia con tecniche knowledge based, sia con tecniche di Deep Learning.

Multi-player  
activity board







Video-call  
board

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## Realization of a realistic NPC with emotion expression in VR

The project encompasses the design and implementation of a sophisticated NPC system with a well-defined personality, dynamic emotional responses to stimuli, state changes, and an advanced dialogue system. The goal is to create an NPC that convincingly emulates human-like emotional behavior, enhancing user immersion and interaction in computer-generated environments

The system design includes the following components that can be associated to different projects:

- 1) Design of an adaptable personality model which governs the NPC's behavioral patterns, preferences, and reactions to external stimuli
- 2) Development of a FSM to govern the NPC's state changes, considering its personality and the emotional stimuli received
- 3) The creation of a dialogue system that facilitates natural language interactions between the user and the NPC
- 4) The portrayal of internal emotions based on Ekman's emotion theory and the FACS, integrating the new Movement SDK for Quest Pro to animate facial expressions in real-time



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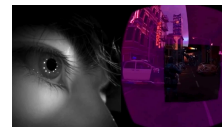


## Eye and face tracking to detect players' affective states in VR

This project proposes the development of a system which uses eye gaze and face expression tracking, along with ML techniques to detect players' affective states. The objective is to create an immersive gaming environment that adapts to players' emotional states, enabling applications in game design, personalized experiences, and human-computer interaction.

The proposed system follows these steps (that can be associated to different projects)::

- 1) Integration of eye gaze and face expression tracking to monitor players' visual attention and focus within the gaming environment and facial expressions based on AU and blendshapes through the Movement SDK with Quest Pro
- 2) Exploitation of ML techniques to analyze the collected eye gaze and face expression data and understand players' affective states, including emotions like joy, surprise, sadness, etc.
- 3) Design of user studies and experiments to collect data from players during gameplay and subsequently analyze them to evaluate the accuracy and reliability of affective state detection



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## Affective states analysis in VR with prosodic data and ML models

The project involves incorporating voice interactions within the game to detect players' affective states using ML models. The objective is to create a game environment that provides insights into players' affective state, facilitating applications in game design, mental health assessment, and personalized gaming experiences

The project includes the following components (that can be associated to different projects):

- 1) Creating interactive gameplay scenarios (Unity) which incorporates voice interactions to enhance the user experience
- 2) Inclusion of voice recognition and processing capabilities within the game using Voice SDK for Quest 2
- 3) The extraction of the features (such as pitch, rhythm, and tone) using Python, along with speech processing algorithms like Pratt
- 4) Training and testing ML models to assess players' affective states based on the prosodic data



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## Multi-modal covert communication with avatars

**Emotional interaction is becoming a discriminant between intelligent and non-intelligent machines. This is particularly true for service robots and interaction in general. This leverage to multi-modal covert information.**

Realization of an empathic avatar endowed with:

- Multi-media output (change of speech pitch / face expression / color)
- Capability of portraying internal emotion (state) through facial animation realized with a simplified FACS as well as change in voice / color / gestures
- Capability of adapting the behaviour (FSM) according to a given metric or desired behaviour or target of the interaction.



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## Handwriting analysis

We have realized a smart pen endowed with pressure sensor, accelerometers and gyroscopes that streams wireless the data. We aim to:

A) Reconstruction of handwriting trace through a smart pen and stroke segmentation.

B) **Graphology** through a smart pen to automatically define the user profile.

**Handwriting**



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## Auto-calibration of drones



La navigazione accurate dei droni richiede la loro localizzazione precisa nello spazio 3D.

Si vuole esplore l'integrazione delle informazioni multi-dimensionali: GPS, accelerometri e video-camera per localizzarsi nello spazio in modo accurate, derivando anche misure di affidabilità statistica puntuali sulle varie misure (**data fusion**).

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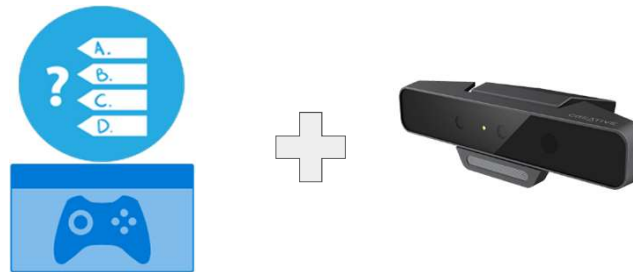
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## Quiz game with empathic feedbacks

Development of a system with a simple quiz game and face's basic emotions classification from camera images. The system will provide appropriated positive/negative feedback through sounds and images on screen based on the correctness of the answer provided and on the player's emotions.

The realization of the system will comprise a set of rules and a finite state machine to drive the interaction.



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## Virtual heritage

To be completed.

Ricostruzione statue mediate droni

- Aggiunta sensore camera al drone presente in dipartimento
- Pianificazione volo
- Acquisizioni
- Fusione acquisizioni e costruzione modello 3D

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