



2 | FIRST STEPS TOWARDS A VIRTUAL COACH WITHIN A SG TO PREVENT MSD

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In this paper, we present a first step implementation of a virtual coach with nonverbal communication interactions. The goals are to improve immersion, guidance and user acceptance of serious games that require motivation and feedback communication.

CONTEXT

The first scope of the virtual coach is a project intending to prevent musculoskeletal-disorders in the automobile and watchmaking industry. Today MSD stats refer to losses of billion of euros in France only [6]. Musculoskeletal disorders have multiple sources such as workplace configuration, noise, stress and mood. Here, our focus was solely on posture and movements. An interactive VR game pushes the user to repeat his natural work actions and analyses them by using a Kinect and a Leap Motion; it gives then feedback about his in-game movements and suggests better ones. In this context, the virtual coach comes into play when the game has to interact with the user. It will act as a motivation and will communicate its results to the user.

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THE COACH

The coach must act as closely as possible to a real-life coach and have a motivational presence in the user's experience. Therefore it must have human-like reactions and emotions. The virtual coach can be divided into various modules.

VALENCE, AROUSAL, DOMINANCE MODULE

The first module is directly linked to the non-verbal side of the coach. Valence, arousal and dominance are vectors to classify emotions in a 3-dimensional space [2]. The coach implements a system to alter its expression based on those variables and will show the user facial expressions according to the user's results. This module is the first step that immerses the player in the game and creates an emotional connection with him.

INTERACTION MODULE

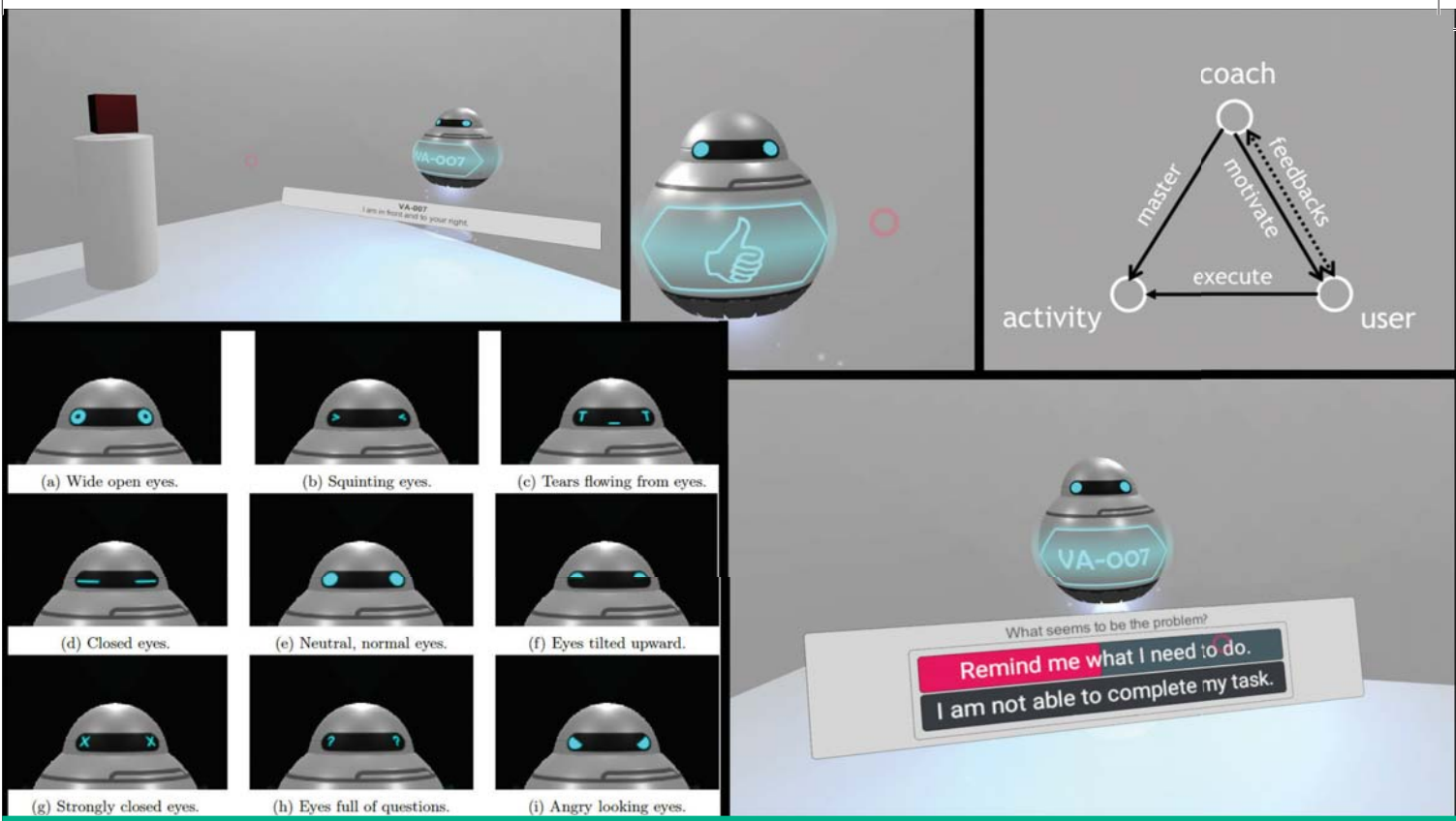
The second coach-integrated module consists of a system that directly receives input from the user. This module can potentially be used with voice recognition, mouse click and virtual reality input. This piece goal is to enable the user communicate directly with the coach by allowing a bidirectional dialogue. Just like a real-life coach, the virtual coach must listen to the user.

DIALOGUE MODULE

The third module is a dialogue system that will have to work in collaboration with all the coach aspects. Whether text-based, speech-based or both, this is the core of clear communication between the user and the virtual coach. First, the dialogue system has to work in partnership with the VAD (valence, arousal, dominance) module and ensure coherence with the coach's displayed emotions.

FLEXIBILITY

The coach component should be as flexible as possible to facilitate its integration in different serious game projects. The pre-requisites are the following:



- › Be adaptable to different kinds of projects such as virtual reality projects, augmented reality projects, mobile projects or desktop games;
- › Be capable of handling a wide range of avatar displays and their specific animations;
- › Handle various dialogue trees and configuration files that help define the interaction between each module;
- › Be able to map itself and interact with different game scenes, whether 2D or 3D.

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CONCLUSION

The virtual coach is an advanced component of serious games: it is being developed and has challenges to ensure its flexibility. Each module is crucial for a good coaching experience, and the final project goals want to improve user comprehension and regular use of the games where it is implemented. Today's serious games face the need to connect to older and inexperienced audiences. This coach is a key to ease their connection to newest technologies and game-like software that might often be seen as not serious and might repulse users. Our coach will have to run through numerous user tests before reaching its desired state, but we have high hopes that he will help convert people to the world of serious games and improve the user experience.

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REFERENCES

- [1] Ding, D., Liu, H.-Y., Cooper, R., Cooper, R. a., Smailagic, A., & Stewiorek, D. (2009). *Virtual Coach Technology for Supporting Self-Care*, 1–32. Retrieved from <http://www.sciencedirect.com/science/article/pii/S1047965109000643>
- [2] Gobron, S., Ahn, J., Thalmann, D., Skowron, M., & Kappas, A. (2013). *Impact Study of Nonverbal Facial Cues on Spontaneous Chatting with Virtual Humans*. *JVRB - Journal of Virtual Reality and Broadcasting*, 10(2013)(6). <http://doi.org/10.20385/1860-2037/10.2013.6>
- [3] Hudlicka, E. (2011). *Virtual coach for mindfulness meditation training*. AAAI Spring Symposium - Technical Report, SS-11-01, 17–24. Retrieved from <http://www.scopus.com/inward/record.uri?eid=2-s2.0-80051488576&partnerID=40&md5=70dd43d58cf3fc4e12019c8a7c5a4b3b>
- [4] Ijsselstein, W. A., de Kort, Y. A. W., Westerink, J. H. D. M., de Jager, M., & Bonants, R. (2006). *Virtual Fitness: Stimulating Exercise Behavior through Media Technology*. *Presence: Teleoperators and Virtual Environments*, 15(6), 688–698. <http://doi.org/10.1162/pres.15.6.688>
- [5] Brox, E., & Hernandez, J. E. G. (2011). *Exergames for elderly: Social exergames to persuade seniors to increase physical activity*. 2011 5th International Conference on Pervasive Computing Technologies for Healthcare (PervasiveHealth) and Workshops, (January), 546–549. <http://doi.org/10.4108/icst.pervasivehealth.2011.246049>
- [6] Mahmoudabadi M. Z. *Représentation partagée des facteurs de risque des troubles musculosquelettiques et comparaison des méthodes d'évaluation : une étude expérimentale dans le secteur de l'assemblage de camions*, Angers; École doctorale Biologie-Santé (Nantes-Angers): Angers, France, 2015