

2019-01477 - Post-Doctoral Research Visit F/M Physio-synchronised 3D virtual avatars

Type de contrat : CDD de la fonction publique
Niveau de diplôme exigé : Thèse ou équivalent
Fonction : Post-Doctorant

A propos du centre ou de la direction fonctionnelle

This postdoc position will involve a collaboration between 3 Inria teams, namely Potioc (Bordeaux), MimeTIC (Rennes) and Hybrid (Rennes). The preferred location for the position will be in the Potioc team in Bordeaux, with regular meetings and visits in the teams located in Rennes. However, it is not a fixed rule and the work could also be conducted in Rennes in case of outstanding applications. More specifically, the position is framed in the context of the national 4-year Inria Project Lab - IPL AVATAR which aims at delivering the next generation of virtual selves, or "avatars", in digital worlds. In particular, the IPL AVATAR wants to push further the limits of perception and interaction through our avatars to obtain avatars that are better embodied and more interactive. Such objectives will notably be attained by designing novel paradigms for interacting with and representing avatars.

Contexte et atouts du poste

Context

Avatars are virtual anthropomorphic characters whose goals are to represent humans in virtual worlds. Such avatars are frequently used in personal applications such as video games, or collaborative scenarios [Pan and Steed 2017, Piumsomboon et al. 2018]. They allow their users to be virtually present in a personal or shared 3D synthetic world.

Due to the massive dissemination of consumer-grade Head-Mounted Displays, avatars have become a major requirement in immersive applications, leading to major improvements in their visual quality. On one hand, it is now possible to personalize the avatar representation to the user, which impacts immersion [Waltemate et al. 2018], as well as to display onto these avatars accurate motions of users through the use of lightweight motion capture systems, and even to display believable facial expressions. On the other hand, avatars still lack from some of the more subtle information regarding the users' psycho-physiological state, and therefore do not generally accurately inform us about their current real state. For example, an avatar may appear as peaceful whereas its user is very stressed or anxious, or appear rested after a strenuous effort while its user might be breathless. Therefore, new techniques are today necessary to enable avatars to more accurately represent the physiological state of its user.

Mission confiée

Objective

The objective of this postdoc is to explore approaches that will better reflect the current state of users by adapting their avatar's visual appearance to their own physiological signals. In this project, we will thus first concentrate on the real-time recording and processing of physiological signals. These signals may include, but are not limited to, breathing, heart rate, galvanic skin response, facial muscle activity (electromyography) or ocular information (eye movements, blinks, pupillometry). While adapting the behaviour of non-player characters to the users' physiological signals can influence their performance, e.g., for sports training in VR [Argelaguet et al. 2015], it is still unclear which signals are relevant to display on one's avatar, and how to display them.

Principales activités

After concentrating on the real-time recording and processing, the second part of this postdoc will explore how to coherently map these modalities to the visual appearance of the avatar. This can be done by mimicking realistic behaviours (e.g. breathing [Bernadette et al. 2019]), or by proposing visual metaphors (e.g. cardiac coherence mapped to a colored animation surrounding the avatar). However, as these signals might have different levels of influence on the user's experience, a large part of the work will consist in assessing the influence of such physio-synchronised avatars. In particular, we will evaluate this impact on two principal dimensions, namely their influence on the sense of embodiment in virtual worlds (i.e., the degree to which users consider the avatar to be their representation in the virtual world), and their influence on the collaboration between remote users (e.g., perception of the other person's physical or emotional state). These evaluations will be achieved by conducting controlled user studies.

Compétences

The candidate should be comfortable with as much following items as possible:

- Graphics programming and tools such as Unity3D
- VR setups (e.g. HMD)
- Character animation
- Physiological sensors recording and processing
- Evaluation methods
- Controlled users studies
- Immersion, presence, embodiment

Avantages

- Subsidized meals
- Partial reimbursement of public transport costs
- Possibility of teleworking (after 6 months of employment) and flexible organization of working hours

Informations générales

- **Thème/Domaine** : Interaction et visualisation
- **Ville** : Talence
- **Centre Inria** : CRI Bordeaux - Sud-Ouest
- **Date de prise de fonction souhaitée** : 2019-10-01
- **Durée de contrat** : 1 an, 8 mois
- **Date limite pour postuler** : 2019-06-30

Contacts

- **Equipe Inria** : **POTIOC**
- **Recruteur** :
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A propos d'Inria

Inria, l'institut national de recherche dédié aux sciences du numérique, promeut l'excellence scientifique et le transfert pour avoir le plus grand impact. Il emploie 2400 personnes. Ses 200 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3000 scientifiques pour relever les défis des sciences informatiques et mathématiques, souvent à l'interface d'autres disciplines. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 160 start-up. L'institut s'efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l'économie.

L'essentiel pour réussir

Bibliography

[Argelaguet et al. 2015] Argelaguet F, Multon F. & Lécuyer A. A methodology for introducing competitive anxiety and pressure in VR sports training. *Front. Robot. AI* 2:10, 2015. <https://doi.org/10.3389/frobt.2015.00010>

[Bernadette et al. 2019] Bernadette, U., Kang, S., Feng, A., DiPaola, S. & Shapiro, A. Speech Breathing in Virtual Humans: An Interactive Model and Empirical Study. *Proceedings of the The Fourth IEEE VR Workshop on Virtual Humans and Crowds in Immersive Environments*, March 2019, Osaka, Japan, 2019.

[Bernal and Maes 2017] Bernal, G., & Maes, P. Emotional beasts: visually expressing emotions through avatars in VR. In *Proceedings of the 2017 CHI Conference Extended Abstracts on Human Factors in Computing Systems*, 2017. <http://dx.doi.org/10.1145/3027063.3053207>

[Groenegrass et al. 2010] Groenegrass, C., Spanlang, B., & Slater, M. The physiological mirror—a system for unconscious control of a virtual environment through physiological activity. *The Visual Computer*, 26(6–8), 649–657, 2010.

[Pan and Steed 2017] Pan, Y., & Steed, A. The impact of self-avatars on trust and collaboration in shared virtual environments. *PloS one*, 12(12), e0189078, 2017.

[Piumsomboon et al. 2018] Piumsomboon, T., Lee, G. A., Hart, J. D., Ens, B., Lindeman, R. W., Thomas, B. H., & Billinghurst, M. Mini-me: An adaptive avatar for mixed reality remote collaboration. In *Proceedings of the 2018 CHI conference on human factors in computing systems* (p. 46). <https://doi.org/10.1145/3173574.3173620>

[Nasoz and Lisetti 2006] Nasoz, F. & Lisetti, C. L. MAUI avatars: Mirroring the user's sensed emotions via expressive multi-ethnic facial avatars. *Journal of Visual Languages & Computing*, 17, 5, 2006. <https://doi.org/10.1016/j.jvlc.2006.05.001>

[Tsoli et al. 2014] Aggeliki Tsoli, Naureen

- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

Rémunération

2653€ / month (before taxes)

Mahmood, and Michael J. Black. 2014. Breathing life into shape: capturing, modeling and animating 3D human breathing. ACM Trans. Graph. 33, 4, 2014. <https://doi.org/10.1145/2601097.2601225>

[Waltemate et al. 2018] Waltemate, T., Gall, D., Roth, D., Botsch, M., & Latoschik, M. E. The impact of avatar personalization and immersion on virtual body ownership, presence, and emotional response. IEEE transactions on visualization and computer graphics, 24(4), 1643-1652, 2018. <https://doi.org/10.1109/TVCG.2018.2794629>

Consignes pour postuler

Thank you to send :

- CV
- Cover letter
- Support letters (mandatory)
- List of publication

Sécurité défense :

Ce poste est susceptible d'être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L'autorisation d'accès à une zone est délivrée par le chef d'établissement, après avis ministériel favorable, tel que défini dans l'arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l'annulation du recrutement.

Politique de recrutement :

Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.

Attention: Les candidatures doivent être déposées en ligne sur le site Inria. Le traitement des candidatures adressées par d'autres canaux n'est pas garanti.