



Offre n°2022-04761

Doctorant F/H Virtual Collaborative Jeu de Paume

Type de contrat : CDD

Niveau de diplôme exigé : Bac + 5 ou équivalent

Fonction : Doctorant

A propos du centre ou de la direction fonctionnelle

The Inria Rennes - Bretagne Atlantique Centre is one of Inria's eight centres and has more than thirty research teams. The Inria Center is a major and recognized player in the field of digital sciences. It is at the heart of a rich R&D and innovation ecosystem: highly innovative PME's, large industrial groups, competitiveness clusters, research and higher education players, laboratories of excellence, technological research institute, etc.

Contexte et atouts du poste

Mission confiée

Thesis goal

As this PhD thesis aims to develop a collaborative virtual reality environment for "Jeu de Paume" (JDP), for training and learning purposes, we have to consider several scientific questions.

The first question to address in the simulation of JDP for training purposes, is to ensure biofidelity. To do this, we first need to perform a physical characterisation of different elements of this sport, essentially the ball, the racket and the court. It is also important to collect data on JDP players in order to analyse the movements during sport practice. The M2S team has already a great experience of collecting such data in many sports, including tennis [10]. The rackets used in JDP are asymmetric, the balls are 30% heavier than in tennis but with a similar size, the court is asymmetric and closed. The court is designed to make the ball bounce on the vertical walls, and on the inclined roofs of the "galleries" around the ground called "carreau". Another particularity is the fact that rackets and balls are still made using traditional craft techniques

To propose a realistic digital model of JDP and its environment, we will need to estimate the physical properties of this equipment. To this end, a physical ball model will be adapted from previous tennis and basketball [4] ball to compute realistic ball trajectories. Moreover, we will analyze the mechanical property of the racket, and its interaction with the ball. Hence, knowing the trajectories of the ball and the racket, it will be possible to compute a realistic behavior of the ball after a strike occurs.

The following question, in order to enable distant playing, is to propose a dynamic model of playing able to circumvent the technical impact of delay due to network. Recent works have demonstrated promising performance of deep neural networks, especially Recurrent Neural Network RNN, to predict the end of a human motion knowing the beginning [11]. This approach is promising but requires a huge amount of training data, for very different motions, which will be difficult to collect for this specific context. Thus, we propose to explore and adapt few shot learning techniques [9], while taking the context of the game into account.

Indeed, knowing the trajectory of the ball, the current state of the game (displacement, left/right strike, etc.), it should be possible to help the network to select the most relevant following motion.

The last question is related to the implementation of learning environments for "Jeu de Paume", and in particular for the complex rules of the game. We will use the scenario engine developed in the Hybrid team for the conception of training environments in industry [1], medical surgery [3], and archaeology [7], in order to formally implement the rules in the virtual reality simulation of the game and to propose learning sessions for new players in order to ease their understanding. This engine implements a petri network based model of description of scenarios associated with a runtime environment to control the progress of a scenario in the simulation with respect to the users' and autonomous characters' behaviour and actions.

The specificities of the sportive context of the project brings new challenges to the #SEVEN model, in particular taking into account gestures inside scenario management, which introduced continuous data in a discrete model, and the integration of predictive models in the scenario engine. This scenario engine will also be a key advantage to provide the current state of the game (and the players) and potential following states, to the prediction model.

References

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Avantages

- Subsidized meals
- Partial reimbursement of public transport costs
- Possibility of teleworking (90 days per year) and flexible organization of working hours
- Partial payment of insurance costs

Rémunération

Monthly gross salary amounting to 1982 euros for the first and second years and 2085 euros for the third year

Informations générales

- **Thème/Domaine** : Interaction et visualisation
Systèmes d'information (BAP E)
- **Ville** : Rennes
- **Centre Inria** : [Centre Inria de l'Université de Rennes](#)
- **Date de prise de fonction souhaitée** : 2022-10-01
- **Durée de contrat** : 3 ans
- **Date limite pour postuler** : 2022-06-10

Contacts

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A propos d'Inria

Inria est l'institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 215 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3900 scientifiques pour relever les défis du numérique, souvent à l'interface d'autres disciplines. L'institut fait appel à de nombreux talents dans plus d'une quarantaine de métiers différents. 900 personnels d'appui à la recherche et à l'innovation contribuent à faire émerger et grandir des projets scientifiques ou entrepreneuriaux qui impactent le monde. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 200 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

Required expertise

- Good knowledge of virtual reality, 3D environments and interaction
- Neural networks
- Working experience in the areas of sport training or body motion capture is an advantage
- Programming experience in C#/C++

A master in Computer Science, or Computer Engineering is required. An equivalent engineering degree (5th year) enabling to start doctoral studies is also accepted.

Languages and skills:

- Very good communication skills in oral and written English.
- Open-mindedness, strong integration skills and team spirit.
- Mostly importantly, we seek highly motivated people.

Please send:

- Your CV along with your Bachelor/Master transcripts
- A motivational letter
- Reference letters
- Any additional documents/links that you think can show your experience (reports, notes, papers, github repositories...)

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.

Consignes pour postuler

Please submit online : your resume, cover letter and letters of recommendation eventually

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.

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