CESAM Project: Research engineer position

Title	**Development of a Physical and Dynamic Simulation Environment for a Supervised Driving Automatic Railway Shuttle**
Supervisor(s)	Michel Basset (Supervisor, Full professor, IRIMAS, UHA) Jonathan Ledy (Co-supervisor, Research engineer, IRIMAS, UHA)
Laboratory	Institut de Recherche en Informatique, Mathématiques, Automatique et Signal IRIMAS UR 7499, Université de Haute-Alsace (UHA)
Place	ENSISA, 12 rue des Frères Lumière, 68093 Mulhouse Cedex, France
Keywords	Mechanical modelling, Automation, Control Theory, ROS
Project description	The CESAM (Charging Electric train with Safe Autonomous Mobility) project aims to develop an automated system for ground charging traction batteries on railway vehicles. This is a collaborative project involving two industrial partners, the CRAN laboratory of Nancy and the IRIMAS institute of the University Haute-Alsace. The proposed position will be carried out at the IRIMAS institute in collaboration with the other partners. In this project, the IRIMAS laboratory proposes to develop an innovative simulator specifically designed for the railway context. The goal is to provide partners and the scientific community with an advanced digital simulation tool in this field. The candidate will work as a Software Development Engineer to support in parallel a PhD thesis. The primary focus will be on the software development of a train simulator based on ProjectChrono, along with its integration with ROS2. The candidate will also be responsible for developing a graphical engine using Unreal Engine to generate sensor data for creating a virtual database for AI training. Additionally, the candidate will bridge the gap between algorithms developed in simulation and their testing on real platforms. **More specifically, the work focuses on:** • Develop and enhance a train simulator. • Interface the train simulator with ROS2 for advanced robotic simulations. • Develop a graphical engine for sensor data generation. • Create a virtual database for AI training using the generated sensor data. • Test and validate the algorithms on real-world platforms. **As required qualifications, the expected candidate should possess:** • Master's degree in engineering or equivalent (Bac+5 level). • Strong programming skills in C++, Python, and ROS. • Experience with vehicle simulators is highly desirable. • Ability to work independently and in a collaborative research environment.

References	• Kalker, J. J. (1979) 'Survey of Wheel—Rail Rolling Contact Theory', *Vehicle System Dynamics*, 8(4), pp. 317–358. doi: 10.1080/00423117908968610. • Tasora, A. *et al.* (2016). Chrono: An Open Source Multi-physics Dynamics Engine. In: Kozubek, T., Blaheta, R., Šístek, J., Rozložník, M., Čermák, M. (eds) High Performance Computing in Science and Engineering. HPCSE 2015. Lecture Notes in Computer Science(), vol 9611. Springer, Cham. https://doi.org/10.1007/978-3-319-40361-8_2 • G. D'Amico *et al*., "TrainSim: A Railway Simulation Framework for LiDAR and Camera Dataset Generation," in *IEEE Transactions on Intelligent Transportation Systems*, vol. 24, no. 12, pp. 15006-15017, Dec. 2023, doi: 10.1109/TITS.2023.3297728. • D. Chikurtev, "Mobile Robot Simulation and Navigation in ROS and Gazebo," *2020 International Conference Automatics and Informatics (ICAI)*, Varna, Bulgaria, 2020, pp. 1-6, doi: 10.1109/ICAI50593.2020.9311330.
Job description	**Job starts date and duration:** January 2025, for a 24-month contract Funding and salary: Salary according to current regulations **2960€ monthly gross salary**
How to apply	**Application procedure:** Please send CV, Master's/engineer's transcripts and covering letter. **Contacts:** Michel BASSET (michel.basset@uha.fr), Jonathan LEDY (jonathan.ledy@uha.fr), David VIEIRA (david.vieira-gois-fernandes@uha.fr).