

Postdoctoral Research Assistant in AI for Autonomous Systems

Charlie Street

My DPhil research is focused on multi-robot coordination under temporal uncertainty, which overlaps substantially with the requirements of the advertised role. Capturing temporal uncertainty requires continuous-time Markov models. For example, I have used Markov automata to capture asynchronous multi-robot execution in continuous-time, extended Markov automata for non-stationary environments, and used continuous-time Markov chains to describe robot policy execution. I have applied multi-robot planning solutions to effectively coordinate robots under congestion, and used multi-robot task allocation techniques assign tasks under spatiotemporal uncertainty. Formal methods underpin many of the solution methods I have developed. For example, I have used model checking techniques to compute distributions over robot presence in the environment, and to reason over the time and locations tasks are announced, for robots to service. If I am successful in applying for this role, I intend to expand on these ideas to coordinate multi-robot systems with formal performance guarantees.

I have the strong communication skills necessary for the role. This is demonstrated by my publication record in high impact venues such as IEEE T-RO and AAMAS. Further, I have experience presenting my work to scientific audiences at conferences including AAMAS and IEEE MRS, as well as the general public. For example, I led demonstrations of a Toyota Human Support Robot and UR-10 manipulator at the Goodwood Festival of Speed, explaining robotics concepts to a non-technical audience. During my DPhil, I have had the opportunity to supervise four undergraduate projects, which will prepare me for the increased supervision responsibilities in the advertised position. I have also engaged with Accenture Labs in an ongoing industrial collaboration on multi-robot warehouse logistics.

In addition to my research, I have spent time integrating my work onto real robot systems. In the First Fleet project, I integrated my work on congestion-aware planning onto fleets of agricultural robots aiding humans in fruit fields. This required substantial software engineering to adapt my work for online settings. Moreover, my work in Team ORion has given me opportunity to deploy a service robot in domestic environments. More so than First Fleet, competing in RoboCup exposed me to the challenges of integrating a robot with manipulators, speech functionality etc.

My previous work has given me many of the necessary skills required for this role, and if successful, I hope to develop them further while producing high quality research.