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Subject: Recommendation for Dr. Andrea Brugnoli

To the attention of the jury of the Lopez-Loreta Prize

Ladies, gentlemen and member of the jury

The field of automatic control is intimately related to the way systems are described by mathematical equations. Indeed, accurate models naturally lead to more efficient and physically motivated control laws. Throughout my carrier, I have been developing the port-Hamiltonian framework for different applications in the field of robotics and tele-manipulation. I strongly believe that this framework possesses all the attributes needed to describe complex engineering systems in a precise manner. In 2018 I was awarded with an ERC advanced grant for the Portwings project and in 2022 with an ERC Proof of Concept related to this project. PortWings has the ambition to gain new insights on the physical mechanisms underlying birds flight, with the aim of perfecting a bio-mimetic robotic bird. The port-Hamiltonian modeling framework was to me the most natural choice to describe the complex physics of flapping flight.

Dr. Brugnoli was hired in the Portwings team in November 2020. His expertise in the field of numerical discretisation of port-Hamiltonian systems made him a perfect candidate for the activities related to the numerical challenges of the project. He has demonstrated to be an extremely talented and open-minded scientist, with a deep knowledge in his area of expertise, and capable of facing new challenges with enthusiasm and scientific rigor.

The conceptualisation and implementation of high-fidelity numerical schemes for physical problems is crucial in engineering sciences. Devising schemes capable of retaining the port-Hamiltonian structure at a discrete level will pave the way to the development of sophisticated software packages for simulating complex multi-physical systems.

To optimise the design of engineering products, it is fundamental to rely on simpler models, that can be run in a reasonable amount of time. The employment of model reduction techniques has become an essential tool in industry. Artificial intelligence may hold the key to unveil non-linear model reduction techniques that are way more effective than the commonly used approaches. However, to obtain explainable and physically motivated reduced models, it is crucial that the physics is not ignored by the reduction process.

The main objectives of the MORPHEUS project are exactly the development of high fidelity discretisation schemes for port-Hamiltonian multi-physical problems and reduction routines that incorporate the physics embedded in the original model. I therefore believe that this project has a great potential to help solving the industrial challenges of the future.

For all these reasons, with this letter I want to express my interest for the MORPHEUS project and my support for Dr. Brugnoli.

With kind regards,

A handwritten signature in black ink, appearing to read 'Stefano Stramigioli', with a long horizontal flourish extending to the right.

Prof.dr.ir. Stefano Stramigioli, (M.Sc., Ph.D.),
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