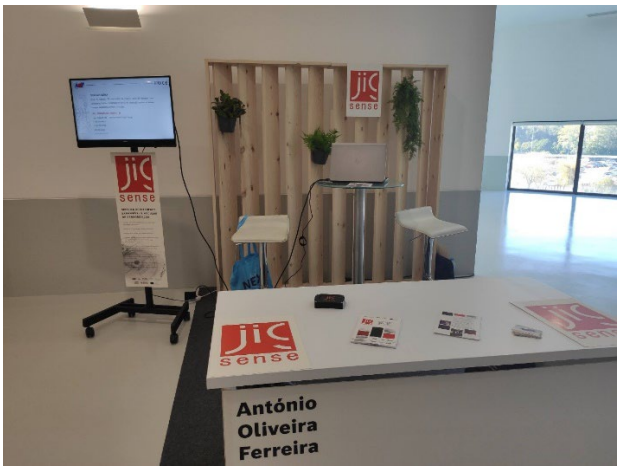
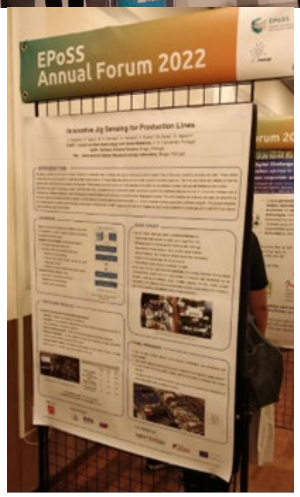
AÇÕES DE DIVULGAÇÃO

Ação de divulgação	Innovation Meeting da Bosch
Local e Data	Portugal (Braga), 28 de abril de 2021
Formas de divulgação	*- Apresentação oral*
Evidências	

Ação de divulgação	NEXT – Driving Tomorrow da Bosch
Local e Data	Portugal (Braga), 9 e 10 de novembro de 2021
Formas de divulgação	*- Stand*
Evidências	

Ação de divulgação	EPoSS Annual Forum 2022
Local e Data	Itália (Turim), 4 e 7 de outubro de 2022
Formas de divulgação	- *Pitch + poster*
Evidências	 

MATERIAL GRÁFICO

Flyer

Poster

Cartaz Explicativo

Video Projeto – versão curta

https://www.youtube.com/watch?v=5VqKPWrZJEs

Poster Cientifico

Innovative Jig Sensing for Production Lines

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INTRODUCTION

Nowadays, metallic jigs are used to support production in assembly lines, ensuring, the quality of the parts and the control lines of the same assembly process are used. These setups incorporate fixtures and sensors to control the position and movement of components and parts and ensure the product's assembly sequence. The lines are robust and reliable so that the system does not increase the complexity of the process. These members must be secure and have real-time information for the software to control and provide feedback to the worker.

JigSense main goal is to develop a system that fulfils the timing requirements for an industrial-based mechatronic system that eliminates/reduces the risk of component damage due to operation use: cabling and sensors, while increasing the component lifetime and reducing unplanned system stoppages/downtime. This work presents the exploited use case: an assembly jig from an industrial production line that is based on an AS-i network of sensors and actuators connected to a central computer running a proprietary software program. This project proposes the development of a modular sensor interface module and a wireless power transfer module to overcome and mitigate the main issues presented by those jigs and in addition to be aligned with the defined system requirements.

OVERVIEW

Applying wireless techniques and methods of principles it is possible to create a system capable of achieving the objectives of the project.

Wireless Communication, data transfer between:

1) Sensing Module (jig moving part);
2) Actuation Module (workstation/ fixed part).
   - Master and slave topology;
   - Protocol with unique header and tail for cyclic redundancy check;
   - Periodic message to check correct data transfer.

Wireless Power Transfer, using:
- Near field or nonradiative technique;
- Magnetic field short distance;
- Custom size and application.

Fixed Structure
AS-i HUB
Actuation System
Power
Bluetooth
Power
Bluetooth
Instrumentation
Mobile Structure
Block Diagram for the system architecture

CASE STUDY

A jig with critical rotational motion, the **main problems** are:
- High number and volume of cables, and a large AS-i Hub;
- Breakage points in moving parts, in various parts of the jig;
- Necessity to allocate space in the jig for AS-i slave modules;
- Distance between AS-i slave and sensor greater than necessary;
- Maximum of 8 sensors per AS-i slave module;
- Workstation's control system cannot be changed.

In this way, the main objectives are established by a sensor interface with low-range communication, weight and low consumption of modular data developed by the sensors, coupling of wireless power transfer capacity for the mobile system, maintaining the reliability of the communication and the correct behaviour of sensors, and that is capable of retrofittable to the current workstation.

Case study (jig: a) AS-i hubs; b) General view

TESTS AND RESULTS

Wireless Communication and actuation performance
- **Reading** – correct functioning in all 32 channels;
- **Actuation** – it was possible to determine the sensor emulation and which electronic to use to validate and execute its operation;
- **Communication protocol** – stable and fast communication has been achieved;
- **Modules integration** – it was possible to prove the operation of data acquisition module, communication module and AS-i hub's;
- **Communication latency** – the latency of the system did not exceed 100 ms. Average latency was 19.4 ms, with a standard deviation of 2.1 ms.

Test scenario for the jig proof of concept

	Voltage (V)	Current (mA)	Power (W)
Power transmitter standby	24	16	0.384
AS-i interface module active	24	44	1.056
Sensor acquisition module active (jig)	12	140	1.68
Consumption of the system working	24	640	15.36

- ✓ **Transmitted power**: 30 W (up to 80W);
- ✓ **Mobile structure power consumption**: 2.6 W.

FINAL REMARKS

A new wireless modular sensor communication architecture was developed and demonstrated:
- The results obtained were very favorable in alignment with the main goals defined;
- It was proven that the system works, without the need to change its control software;
- The jig was able to complete its work cycle, ensuring the correct communication of its control system with all relevant sensors.

Modules developed for the new system

PROJECT
CONSORTIUM
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2020

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ESPECIFICAÇÕES TÉCNICAS PROTÓTIPO / DEMONSTRADOR

PROTÓTIPO / DEMONSTRADOR