Press release

1 March 2023

3D IoT project - FlexFab

A prototyping and production cell for small batches of surface-functionalised objects using a direct printed circuit.

La Région Auvergne-Rhône-Alpes

Introducing the 3D IoT project - FlexFab 3

Organizations 5

presse.pagora@grenoble-inp.fr — lgp2.grenoble-inp.fr

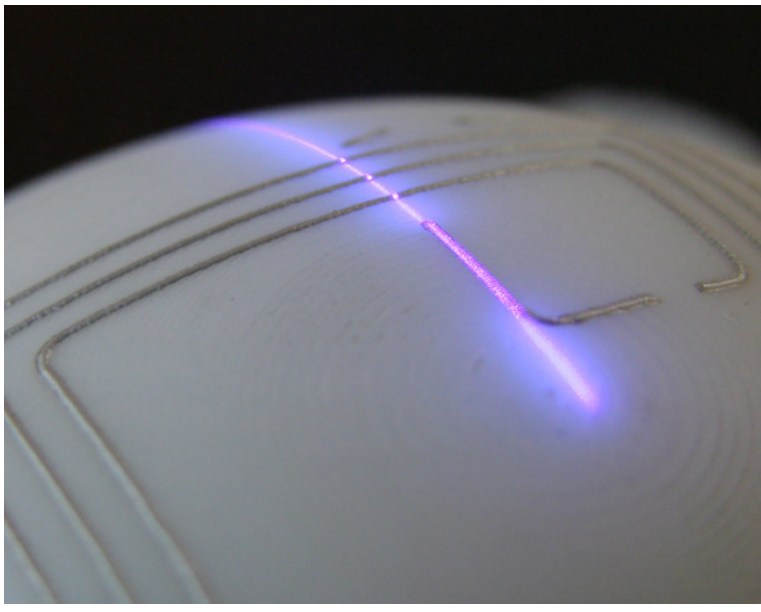
Context

There has been growing interest over the last few years **in integrating electronic circuits into the surface of 3D objects (shells, chassis, etc.)** and in replacing petrochemical plastics with bio-based materials. Being able to integrate electronic and electrical components directly onto biocomposite 3D objects both **eliminates wiring and PCBs** (*Printed Circuit Boards*), thus reducing weight/volume, and **reduces the environmental impact of the final device**.

From this interest emerges **a growing demand for prototyping processes in the fields of electronics and connected objects** to simplify and automate the process of integrating electronic components in 3D objects. Since the 2000s, **plastronics technologies have been developing** and have begun to appear on the market. This field, which combines plastics and electronics, **facilitates the integration of electronics into objects to make them functional**. This means that some electronic functions and connections between components no longer require a standard 2D electronic board, but are directly integrated into the object.

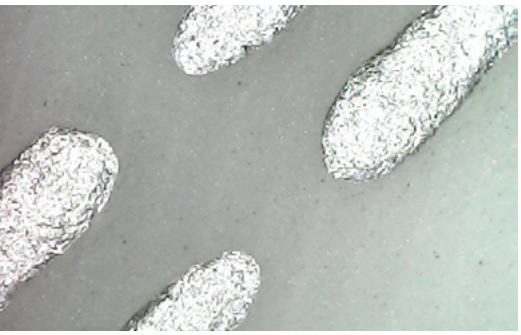
Printed electronics offer a versatile and easy-to-implement alternative for prototyping and small batches. This **technology consists of printing an electrically conductive ink on the surface of existing 3D objects** in order to integrate the electronic functions into the object. For small batches, the advantage is that there are **no material restrictions for the manufacture of the object**. Due to the variety of inks (viscous, fluid, aqueous or solvent-based, metallic or organic, etc.) and integration systems (pressure, screw, drop ejection, etc.) available, high-quality **circuit printing can be carried out on any material**. The use of additive technology also saves material, as only the necessary amount of material is used, there is no waste. The process is straightforward: the conductor and tracks are created in one step.

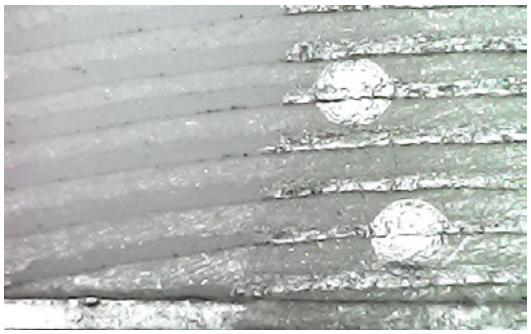
At the same time, the industrial robotics market is constantly evolving, with more than two million industrial robots in the world today. The market has more than tripled in 10 years. Many robot models have been developed to meet the requirements of new applications in terms of weight to be transported, range of motion, speed and precision. However, **there is currently no easy-to-use system available on the 3D printing electronics market**.



Aims of the 3D IoT project - FlexFab

LGP2, **in close collaboration with the companies AlpRobotic, Rtone and CoDe-IT, and with funding from the Auvergne Rhône Alpes region, has created a prototyping and small batch production cell for surface-functionalised objects using a direct printed circuit**. Printed conductive tracks allow electronic functions to be integrated directly on the surface of the object without the systematic transfer of one or more conventional 2D electronic boards and replacing the electrical wires between components with printed conductive tracks.





All **operations are carried out by 6-axis robots on which various tools are mounted**, including a laser scanner and print head and a pick-and-place system.

The platform features **dedicated software that manages the entire production process and automatically creates machine code to control the manufacturing process**. This software, with a simplified interface and calibration protocol, will mean that the prototyping line can be used by non-robotics experts and will enable rapid turnaround in product changes and the customisation of circuit boards.

The LGP2, Laboratory of Process Engineering for Biorefinery, Bio-based Materials and Functional Printing, conducts innovative research in order to meet economic and societal expectations with regard to sustainable development (green chemistry, biorefinery, clean processes, recycling, bio-sourced materials, renewable energies) and traceability and security (functional materials, smart paper and packaging, printed electronics, 3D printing).

ALPROBOTIC designs and manufactures high-precision robotic units for each stage of the finishing processes, dedicated to medical implants and watch parts. The company also develops software for logistics management and manufacturing monitoring.

ALPROBOTIC works with major operators in the medical and watchmaking industries in Switzerland. It uses intelligent robotic cells in its workshops, optimising the manufacture and quality of their high value-added parts.

Rtone, a Business Unit of the ABMI Group, is a product development studio. It supports its customers in the study, design, industrialisation, production and maintenance of intelligent solutions.

Rtone has 80 employees and offers comprehensive personalised solutions in the product design market.

The company covers all engineering needs: mechanical, electronic, embedded software, cloud and mobile.

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