3D Printer – Concepts

3D printing has been considered as a disruptive technology with application in innumerous fields, from industries as diverse as automotive, defense, aerospace, electronics, to the healthcare, the teaching and the hobby market (do it yourself - DIY). A simple 3D printing machine that can produce a variety of different products using different materials, coupled with the possibility of producing it closer to the point of use. These may have a huge impact on the way of implementing new business models and on the economics of manufacturing.

3D printers are currently used mainly to produce a single part (batch of one), created on demand, that can be considered as a prototype. These prototypes are normally small sized parts but they can have complex forms and structures that could be difficult or even impossible to produce using other manufacturing methods. The availability of using multiple materials on the same printer that can be incorporated in the same produced part is enlarging the applicability of 3D printers.

3D printers, that use an additive manufacturing process, started using ABS plastics as the basic material, but today there is already a large range of other materials that are possible to be used such as metals, rubber, ceramics, glass, food and, in the biology field, the use of human tissues. In this type of printers, successive layers of material are deposited to create an object, with the shape or geometry defined in a 3D model. The computer 3D model is used to define the layers and paths to produce the object. The printer controller implements the control of the printer axis and of the printing head. Currently there is a wide offer of 3D printers in the market, ranging from low-cost ones (200 € - 1300 €), such as RepRap or Ultimaker, dedicated to the hobby market, up to professional type (up to 300000 €) such as the ones available from 3Dsystems, Materialise and Stratasys companies.

The available 3D printer (RepRap BCN3D+) is from the RepRap community that offers open source and self-replicating printers. This printer uses a three axis cartesian configuration, with the Y axis decoupled from the X and Z axes, mounted together on a prismatic structure, providing high structural rigidity. The printer implements the fused deposition modelling (FDM) technology and uses thermoplastics materials such as polylactide (PLA) and acrylonitrile butadiene styrene (ABS).