Lecture 1

Note Title

Background: The portmanteau "Mechatronics" (*mecha* for mechanisms, and *tronics* for electronics) was first coined by Mr. Tetsuro Mori, a senior engineer at the Japanese company Yaskawa, in 1969. The term was originally created to designate the field of study of automata (self-operating machines) from an engineering perspective. Today, this interdisciplinary degree involves courses not only in mechanics, electronics, robotics and control engineering, but also in computer engineering, software engineering, communications, digital signal processing and even nanotechnology (MEMS) and biotechnology.

Being such a broad area, many universities around the world offer today either a specific four-year degree or a multi-disciplinary degree in Mechatronics Engineering – the latter is usually obtained by taking classes from departments such as ME, ECE, and CS. Since every mechatronic system requires a mechanism and the sensors/actuators to control such mechanism, in this introductory course, we will focus on three major topics, as explained next.

Course Description: Course focuses on: 1) mechatronic systems and their components; 2) the mathematical tools used to model industrial and mobile robots; and 3) vision sensors, their underlying models and the algorithms that allow us to control and interact with robots

The Field of Mechatronics

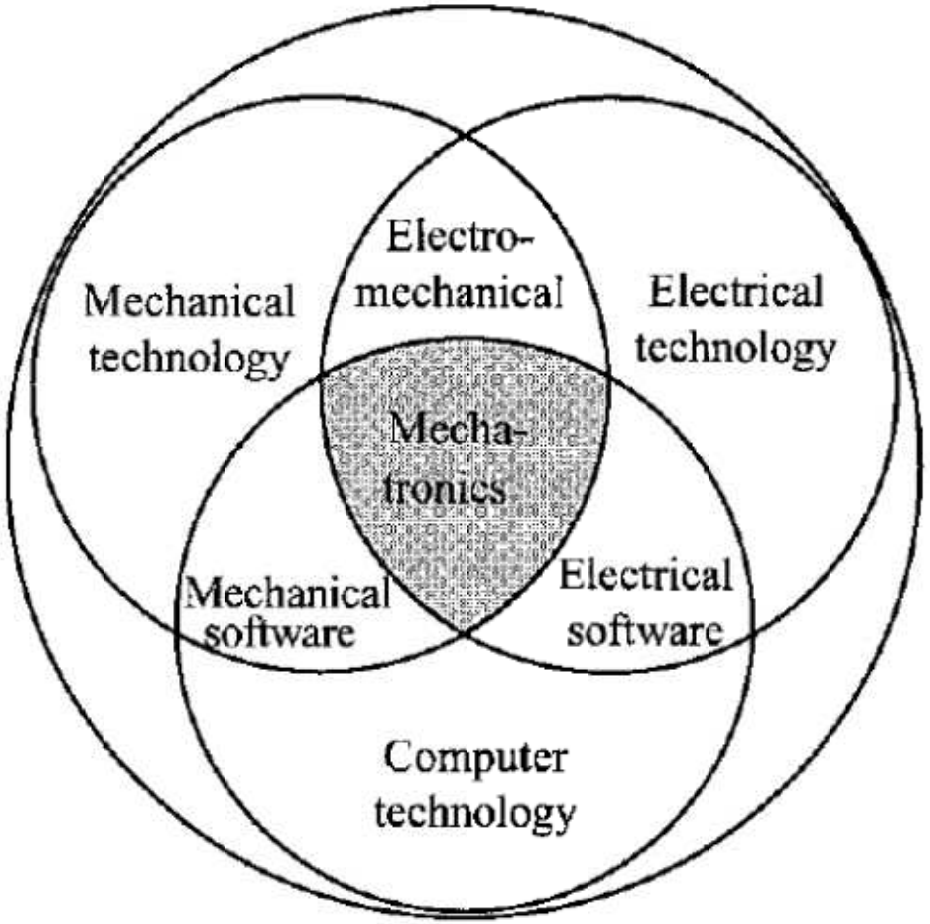


FIGURE 1.1: The field of mechatronics: intersection of mechanical, electrical, and computer science.

Analogy w/ Physical Systems

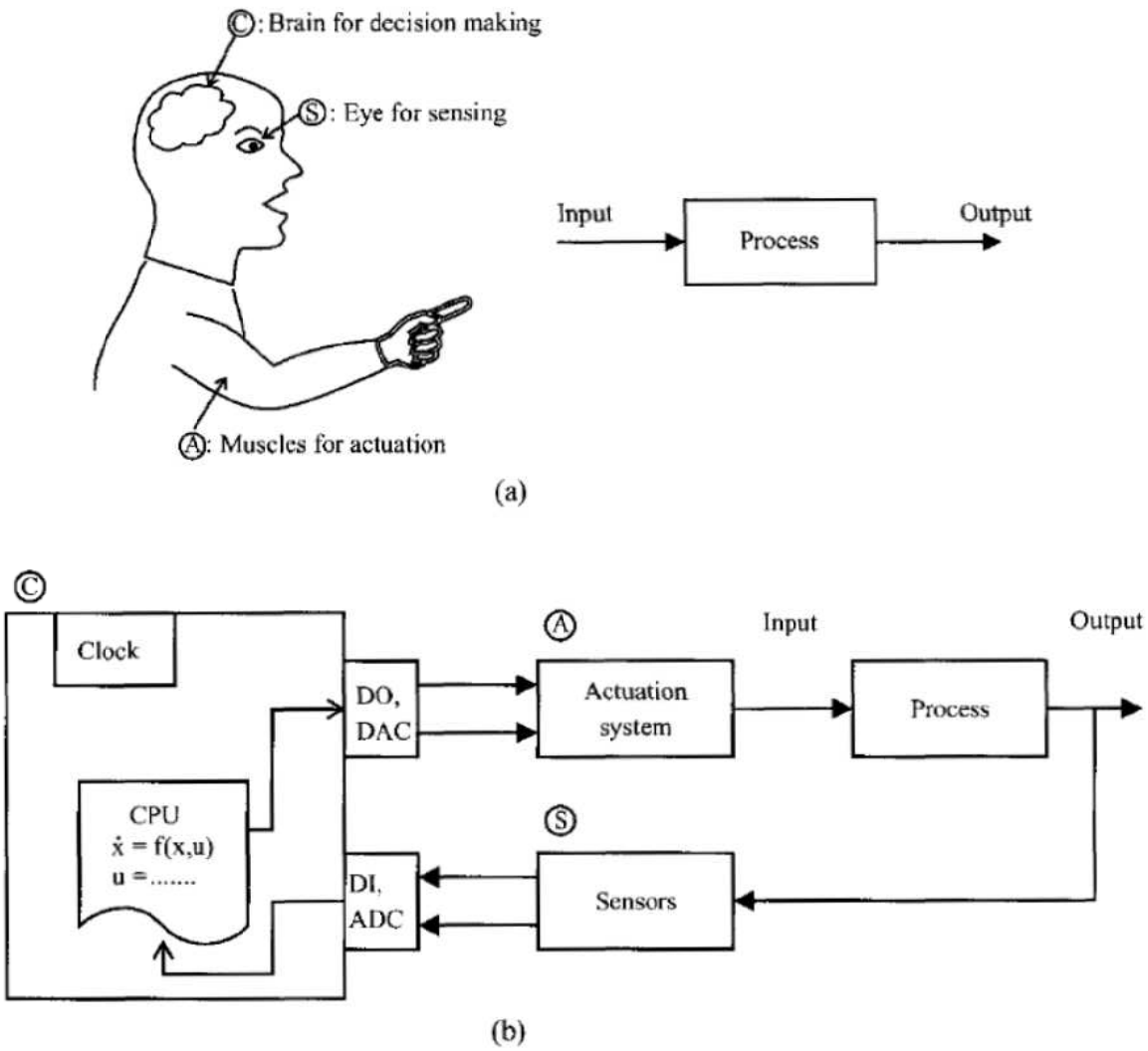


FIGURE 1.2: Manual and automatic control system analogy: (a) human controlled and (b) computer controlled.

Simplified Diagram of Components

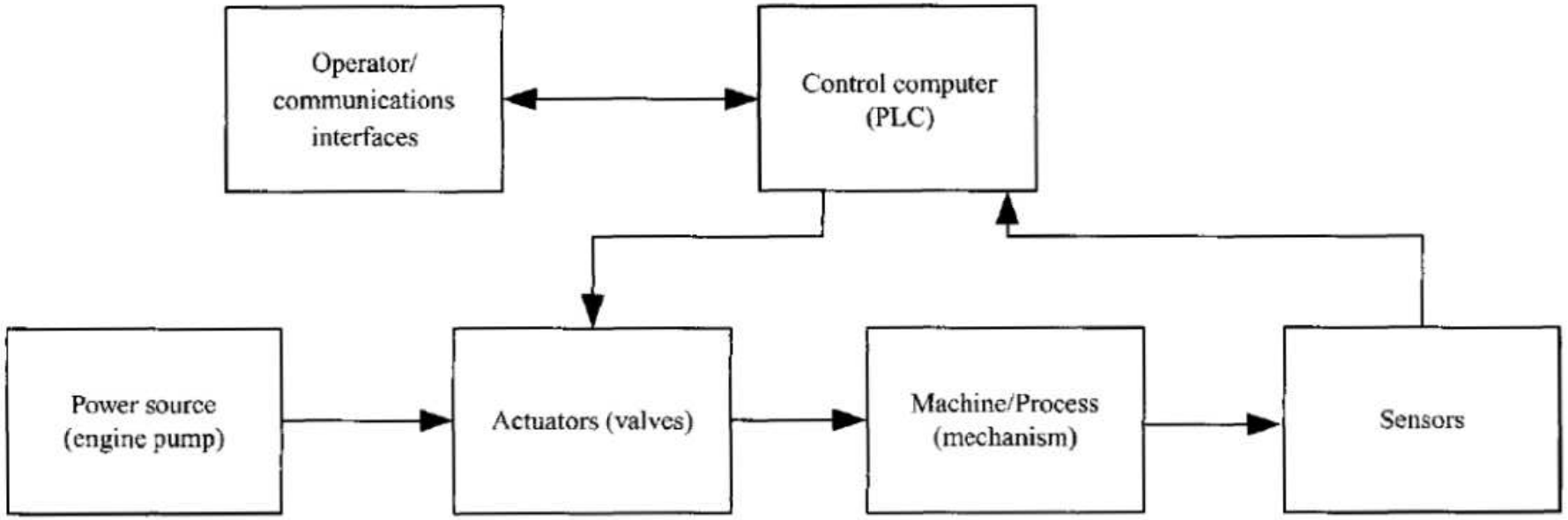


FIGURE 1.3: Main components of any mechatronic system: mechanical structure, sensors, actuators, decision-making component (microcontroller), power source, and human/supervisory interfaces.

Complete Diagram of Components

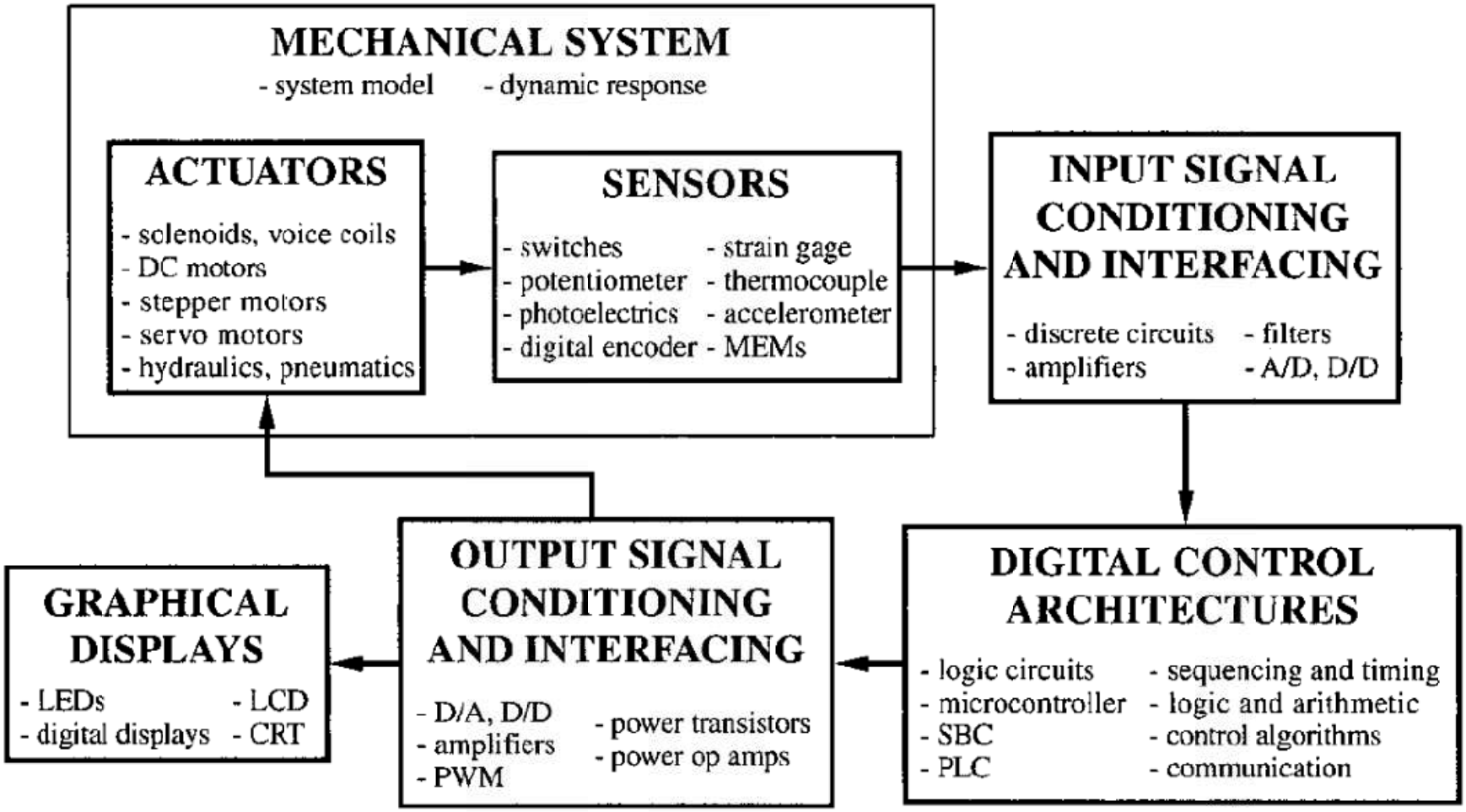


Figure 1.1 Mechatronic system components.

EXAMPLE

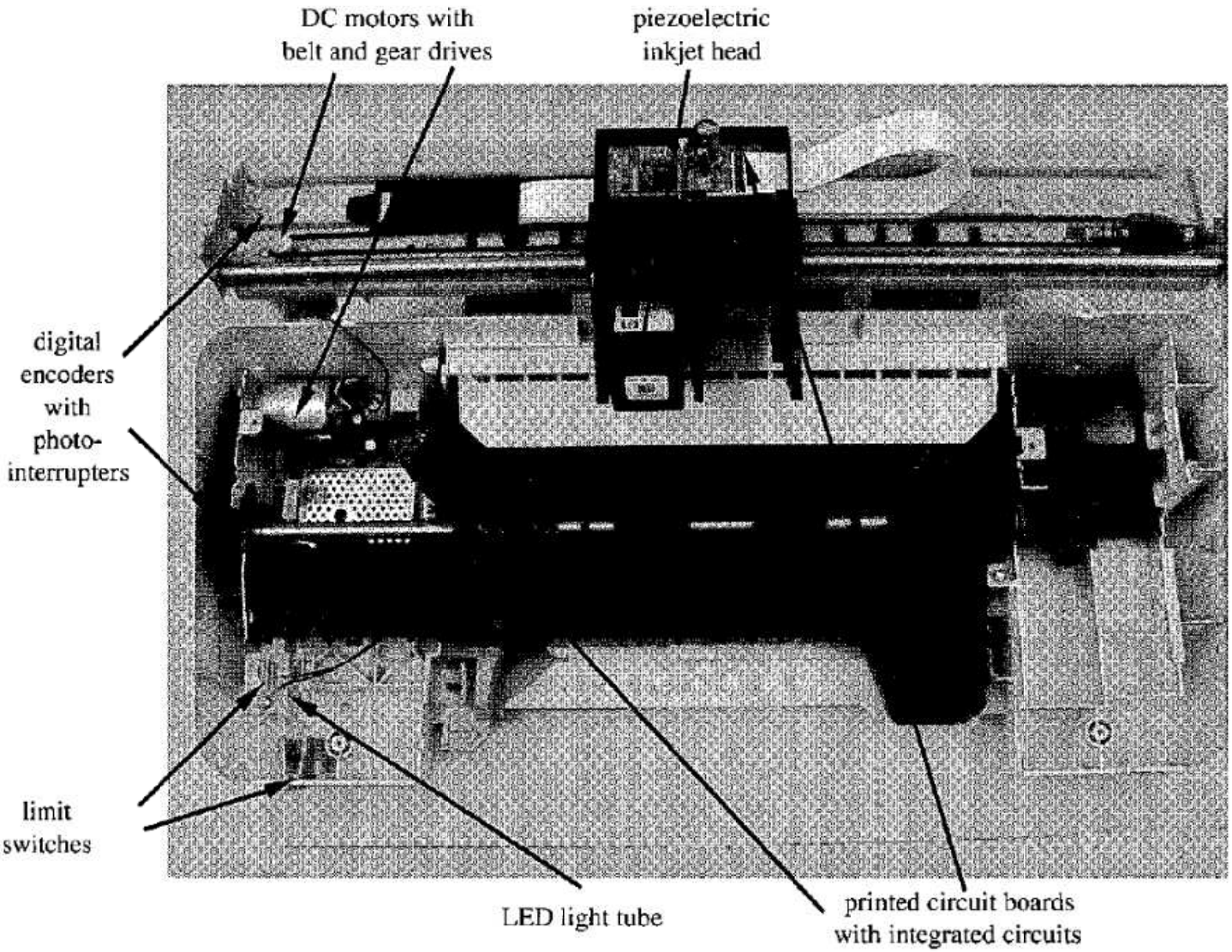
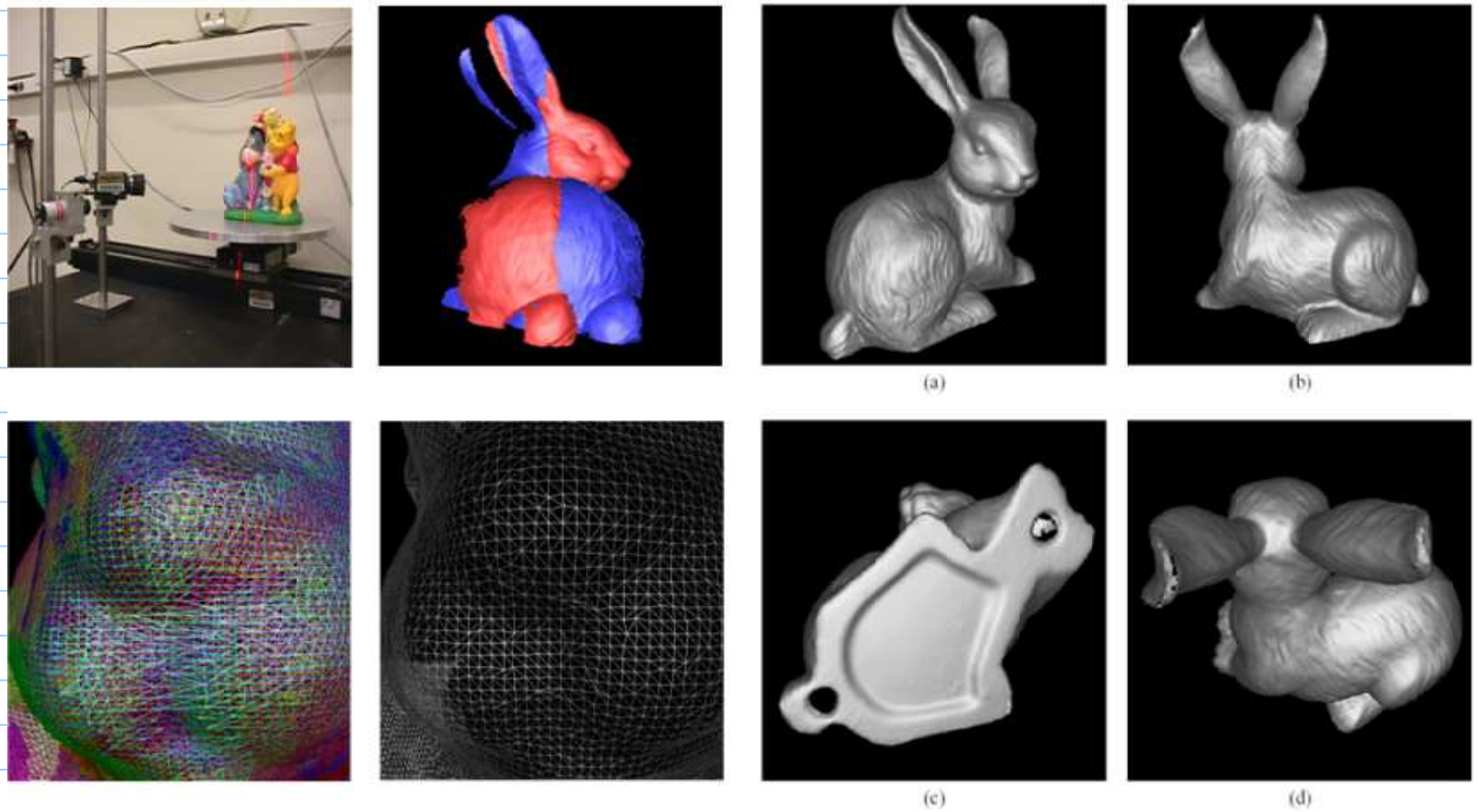


Figure 1.2 Inkjet printer components.

EXAMPLE

3D Modelling



3D Models from Structured-Light Scanners

Visual Servoing

SENSORS = CAMERAS