

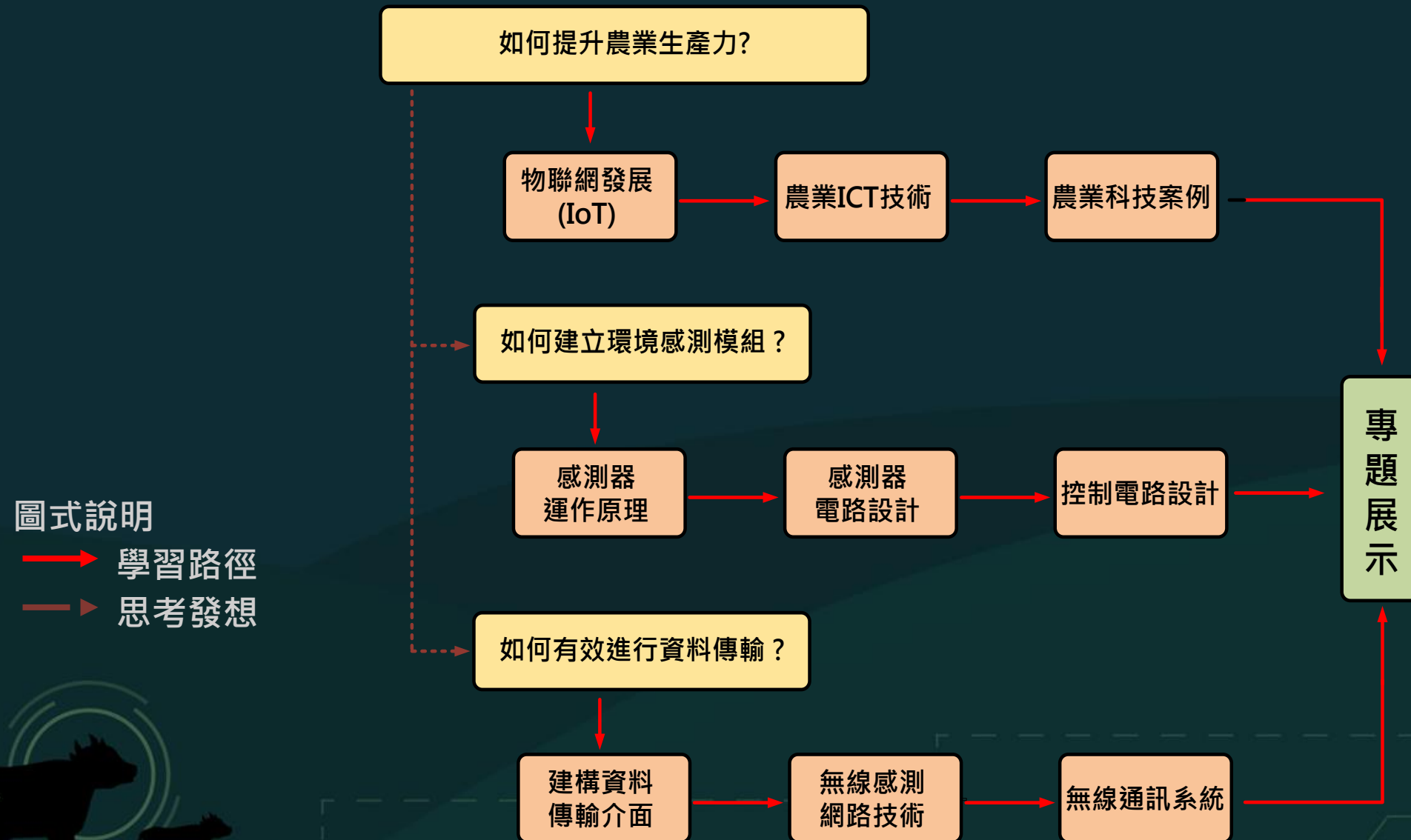


智慧農業與ICT整合應用實例

ICT for Intelligent Agriculture Applications

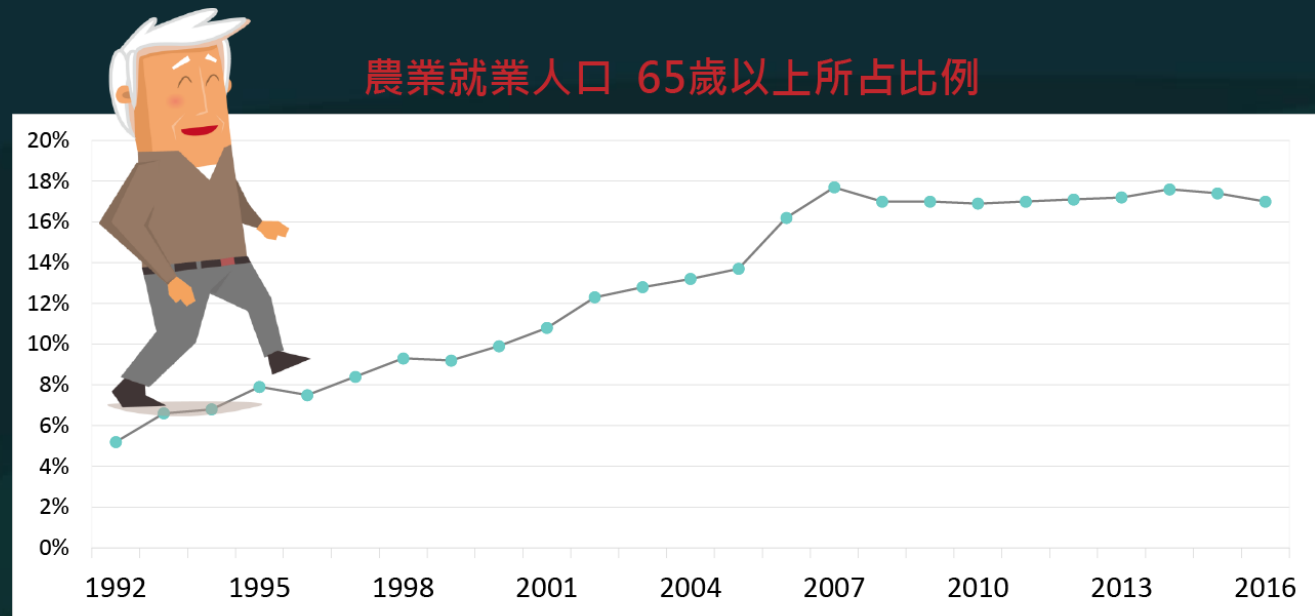
農作物生長環境監測系統製作與開發

ICT for Intelligent Agriculture



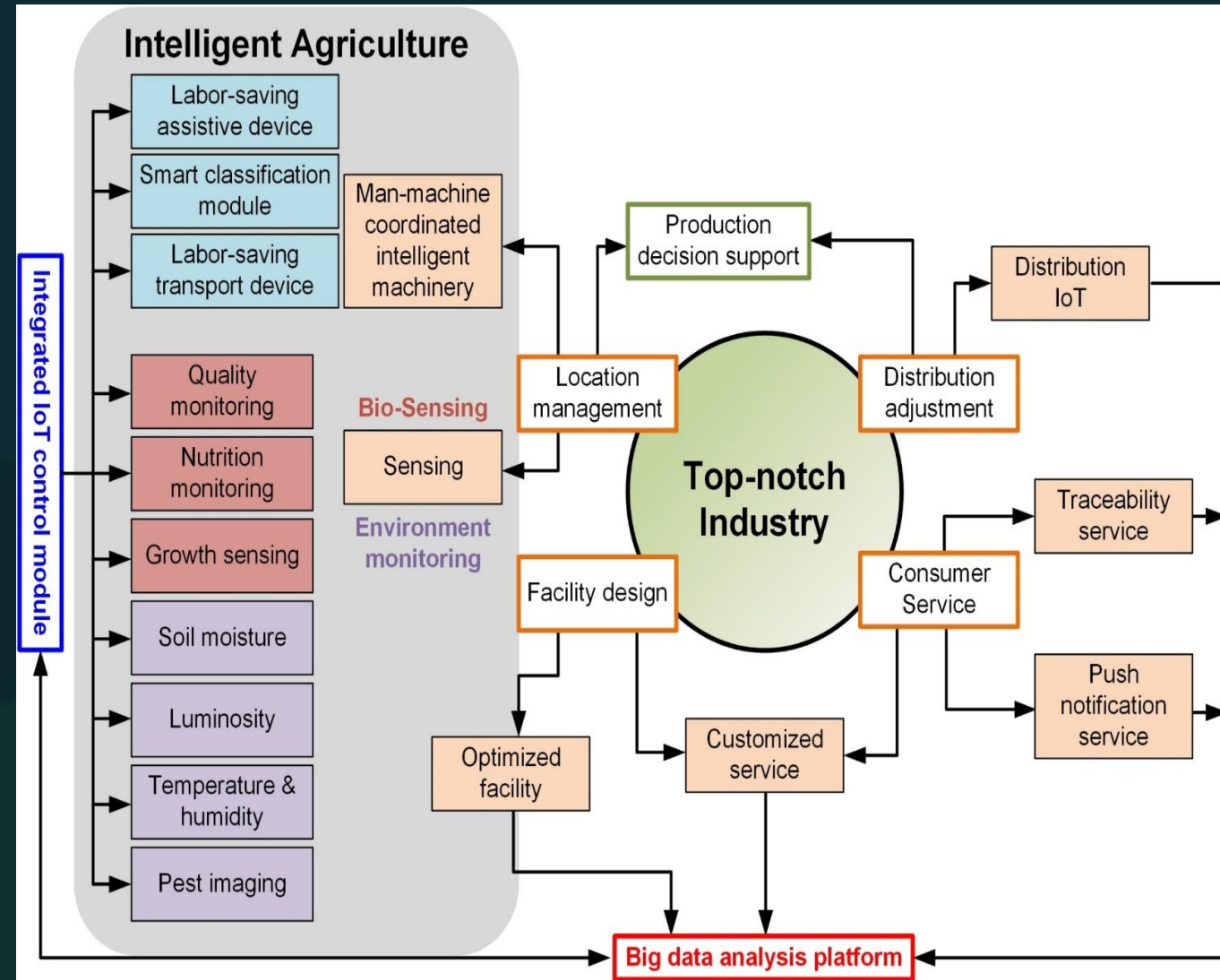
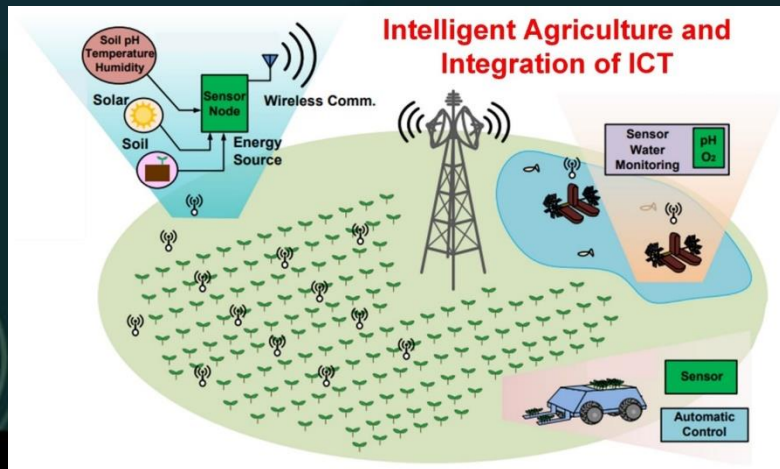
Aging Society

- Aging population, food shortage, and climate changes threaten the human survivals.
- The increasing world populations but less food supplies due to the climate changes



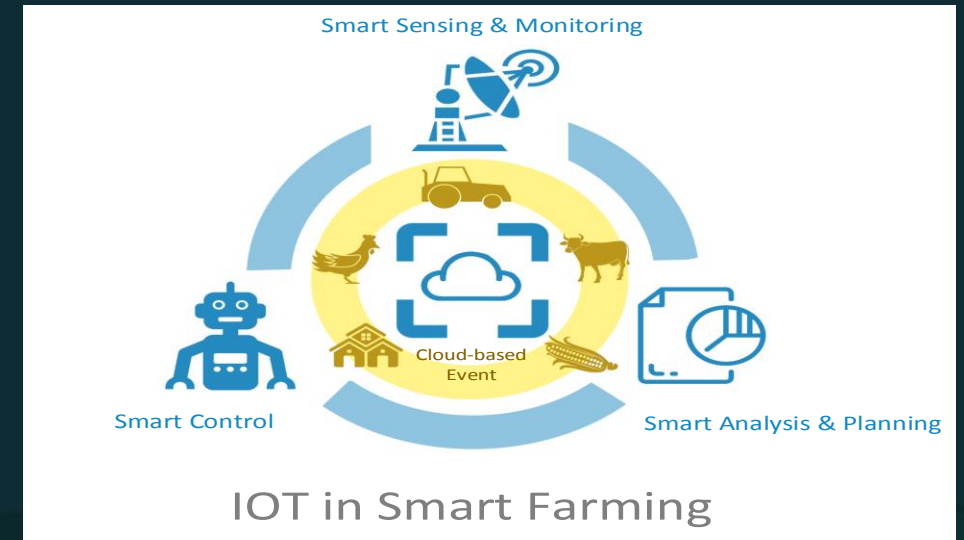
Architecture of Agriculture 4.0

- Intelligent Agriculture (IA) 4.0 requires technology of sensing, big data analysis, automation, and smart cultivation.
- Biotechnology, communication and sensing technology are essential in IA 4.0.



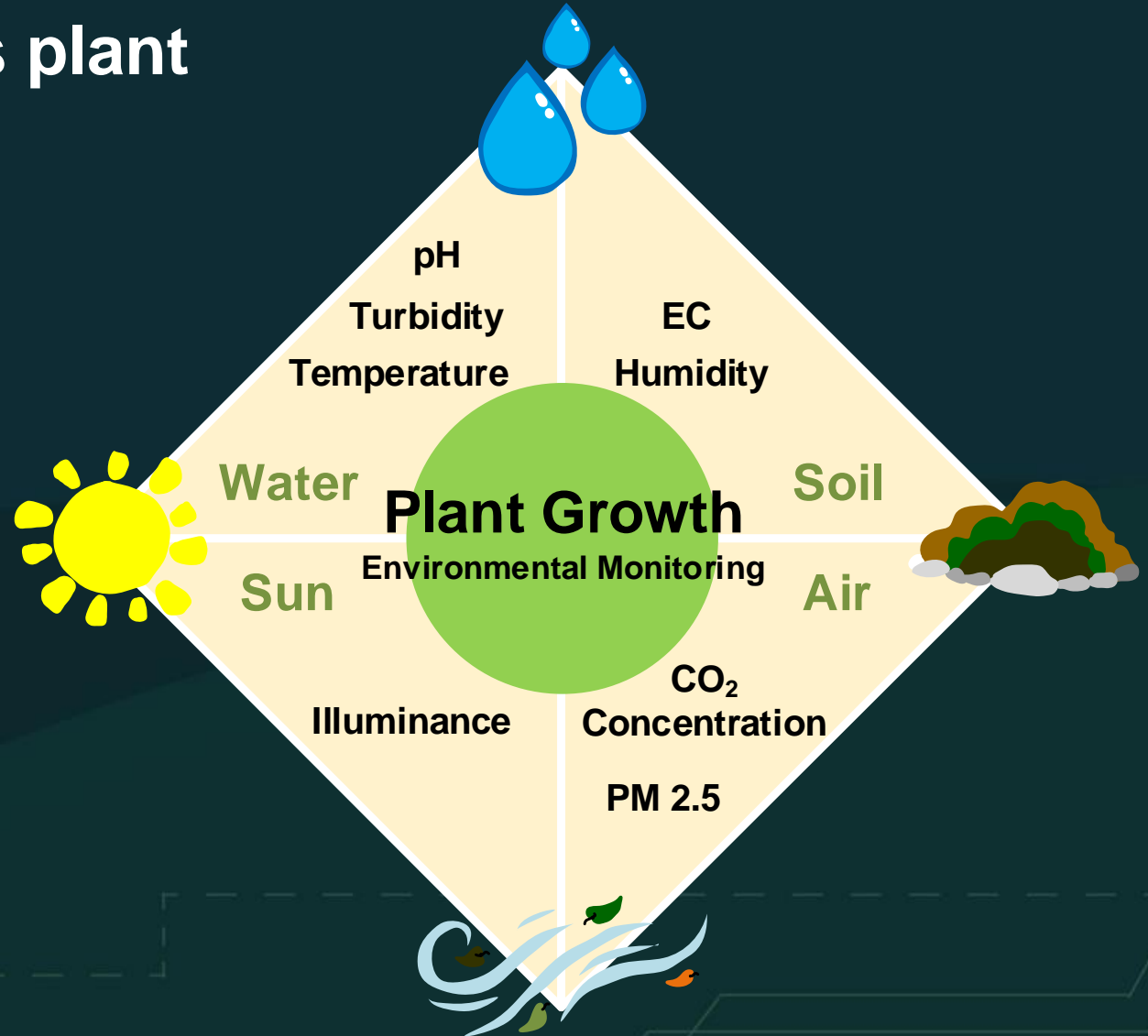
IoT Technology for Smart Farming

- ❑ **Wireless**
 - Reduce cable
 - Real-time information
- ❑ **Control**
 - Machines replace human
 - Image discrimination
 - Environmental monitoring
- ❑ **Big Data**
 - Precision prediction analysis



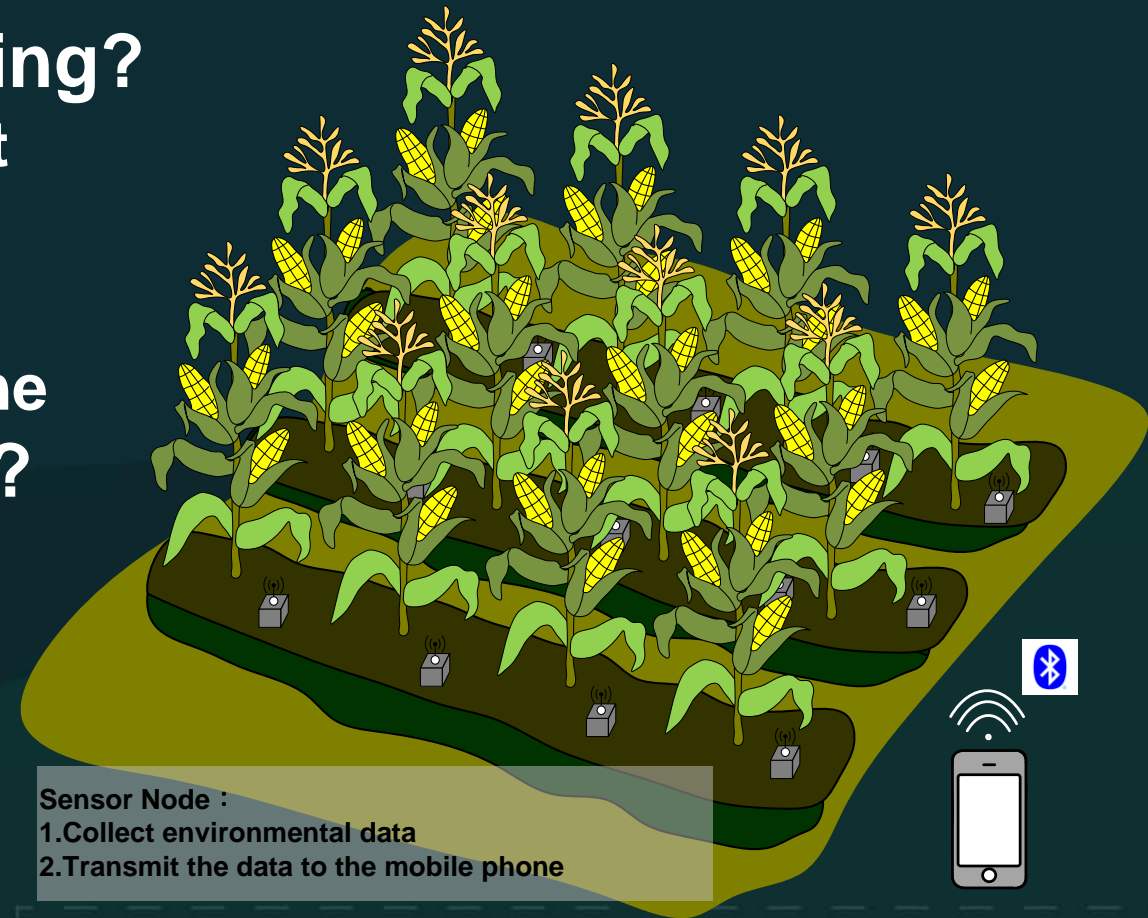
Key Parameters for Plant Growth

- ❑ Plant care effectively controls plant quality.
- ❑ Key factors for plant growth :
 - Sun
 - Air
 - Water
 - Soil
 - Temperature



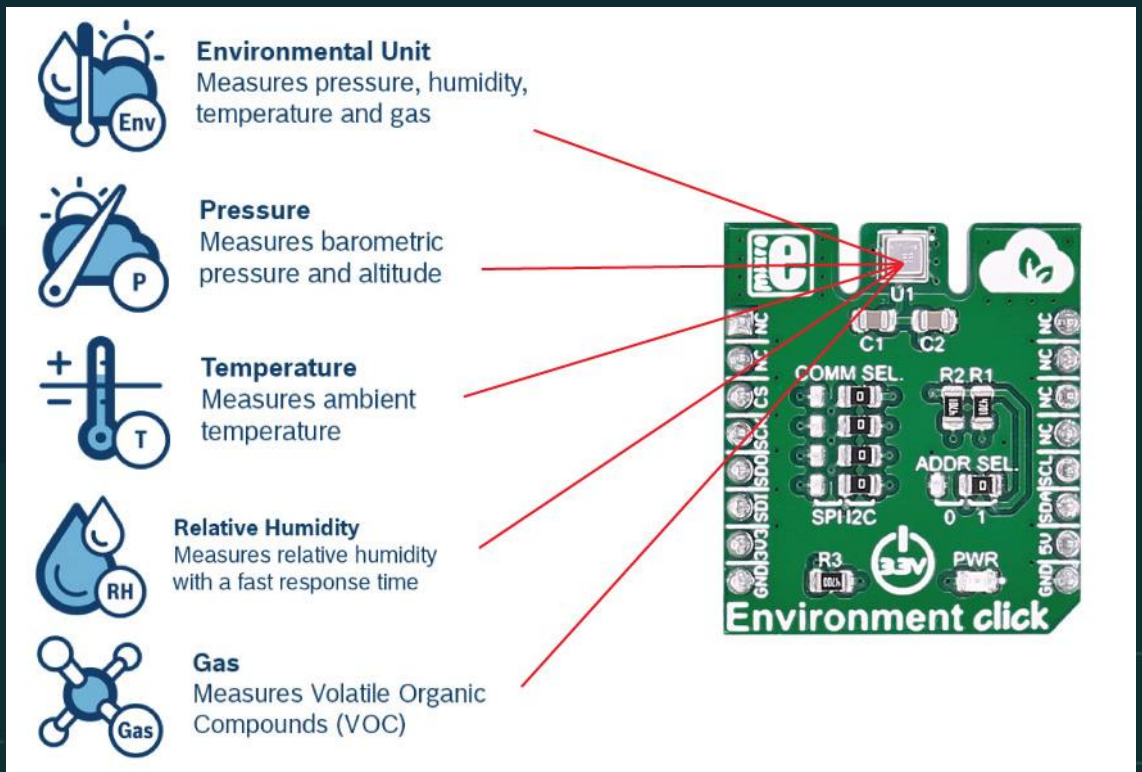
Environmental Monitoring

- ❑ How to do environmental monitoring?
 - Place the sensor node near the plant
- ❑ What the sensor node will do?
 - **Collect** environmental data
 - **Transmit** the data to the mobile phone
- ❑ What the mobile/computer will do?
 - **Display** real-time data on the screen
 - **Analyze** environmental data



Sensor Interface

- ❑ The sensor sends the data to the MCU and connects them through the PCB board.
- ❑ The form of each sensor output is different, so we need to understand the data sheets.
- ❑ **Sensor**
 - pH sensor
 - Thermocouple
 - Hygrometer
 - Turbidimeter
 - PM2.5 dust sensor

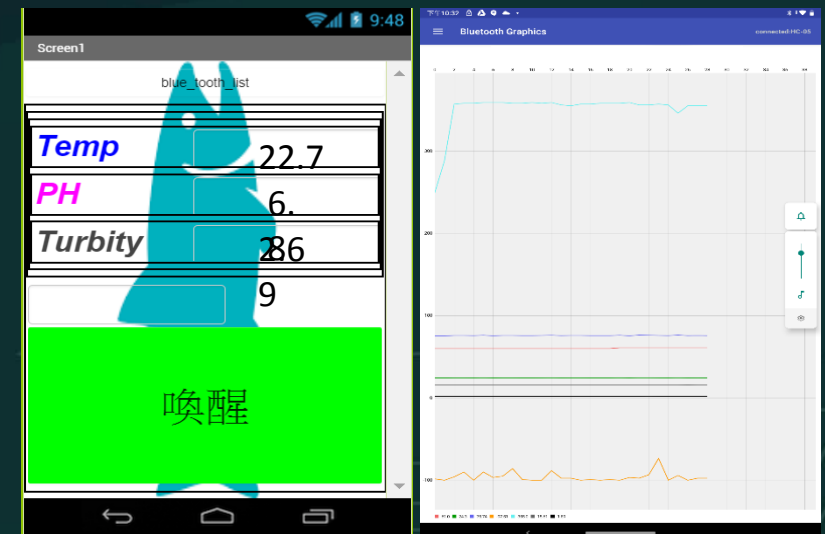
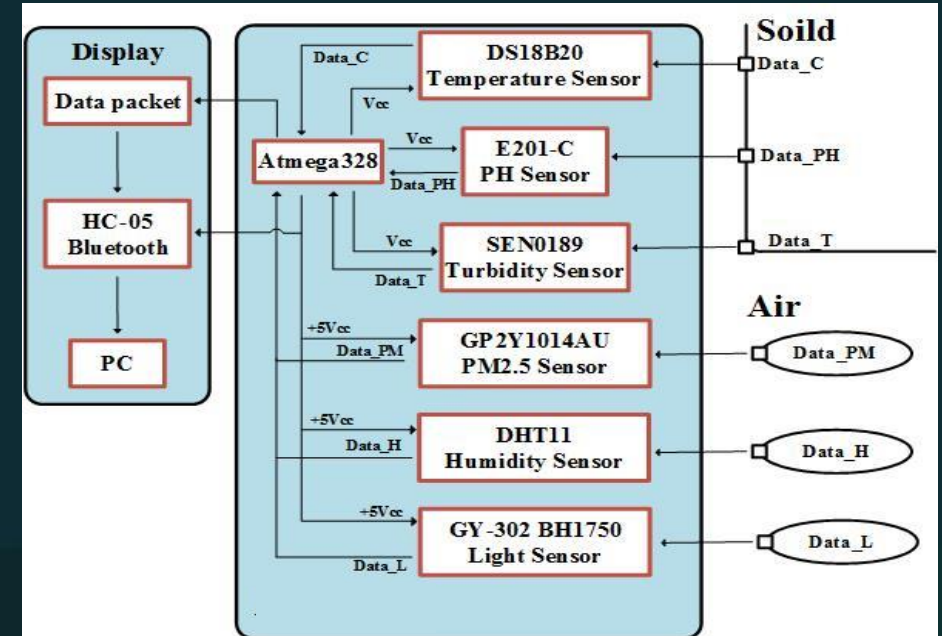


IoT System Design

1. Choose the parameter you want to get
2. Find the components which can use
3. Sensor communicate with MCU
4. Try to display what you get

Design flow

- Circuit diagram design
- Build the schematic of the required components
- Building the system schematic



Example: Mushroom Cultivation Monitoring

- The cultivation of mushroom species requires precise control of the concentration of CO₂ and the ability to operate in a high humidity environment.



Hand-on Projects:

- Plant Talks: Smart Plant Pot
 - Use the basic logics to build a smart plant pot that interacts with the plant by environment information
 - Requirement: control logic design, sensor interface, multiparameter sensors, and display information
- Wireless environment monitoring module
 - Monitor the wide-range climate/soil information and automatic feedback control the water and fertilizer
 - Requirement: Use MCU for signal control and design Interface circuit boards with off-shelf components





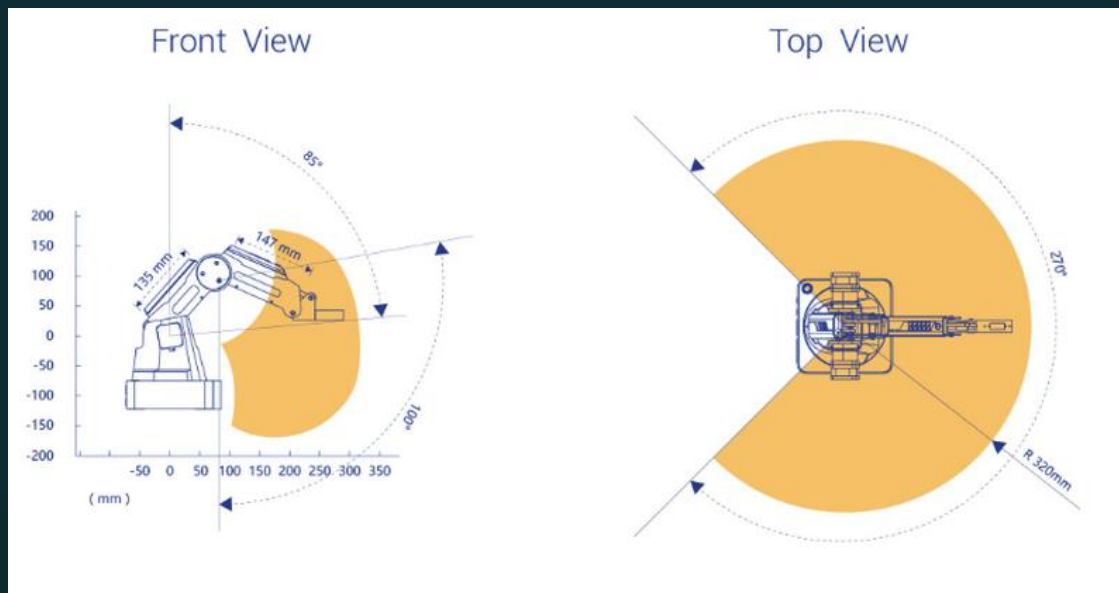
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ICT for Intelligent Agriculture Applications

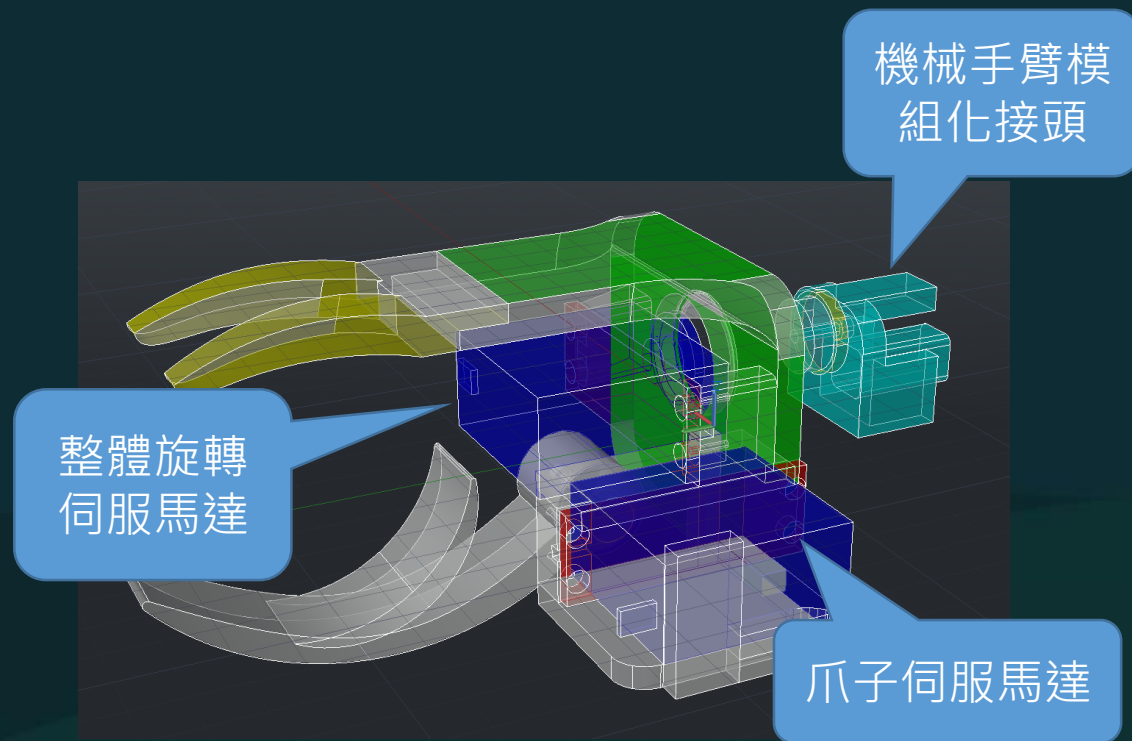
田間機器人資通訊整合應用



機械手臂與爪具



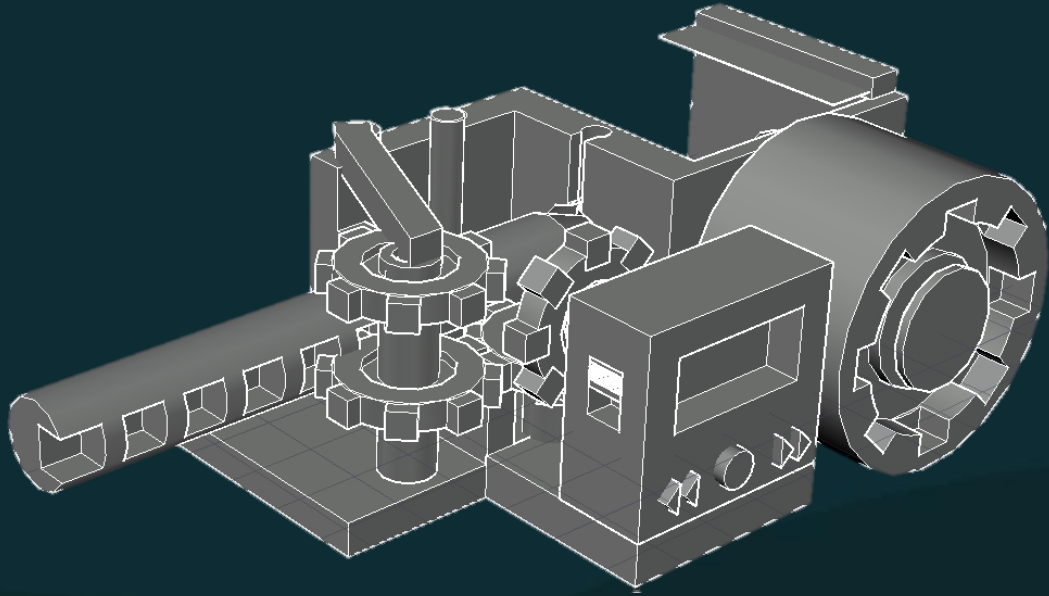
機械手臂空間移動範圍



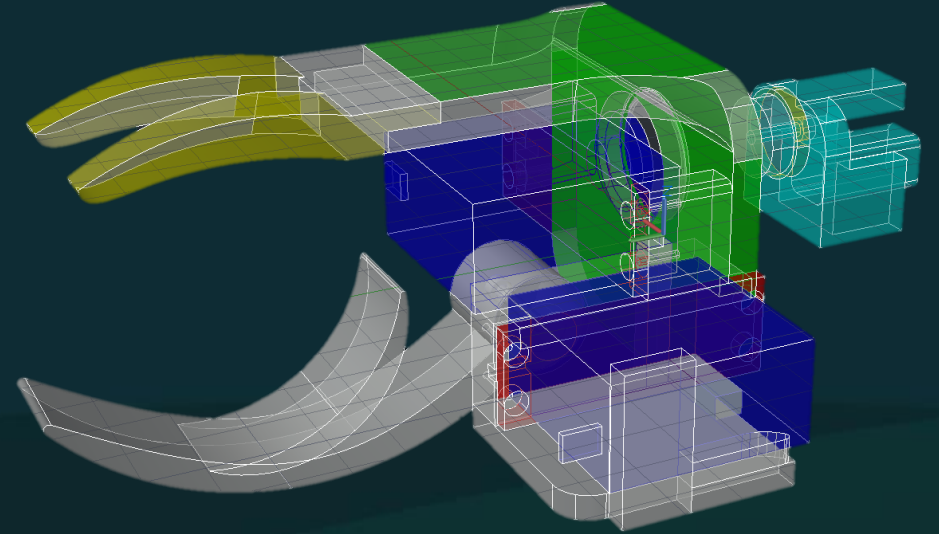
3D列印爪具透視圖



3D列印爪具相關作品



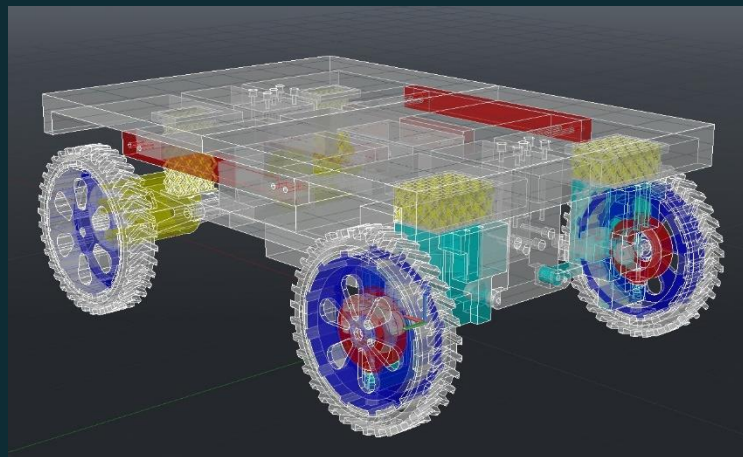
3D列印採摘香蕉爪具
利用齒輪帶動鋼條刺穿，
再用刀片切段香蕉莖部採
收香蕉



3D列印採摘番茄爪具
利用三爪爪具夾取番茄後，再
用剪刀剪斷番茄蒂頭採收番茄



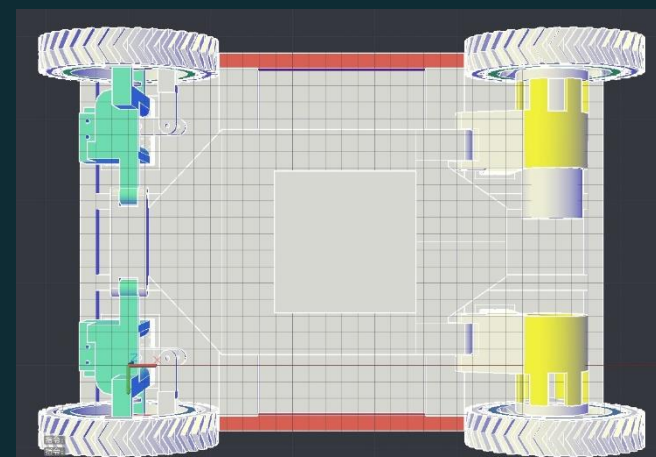
3D列印自走車架構



整體外觀



前視圖



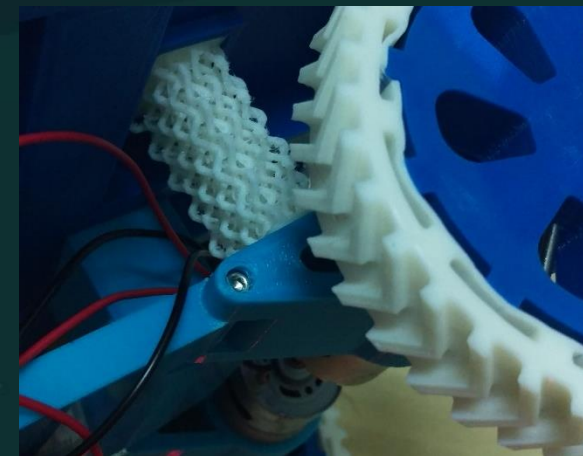
下視圖



控制電路板



前輪特寫



後輪避震結構

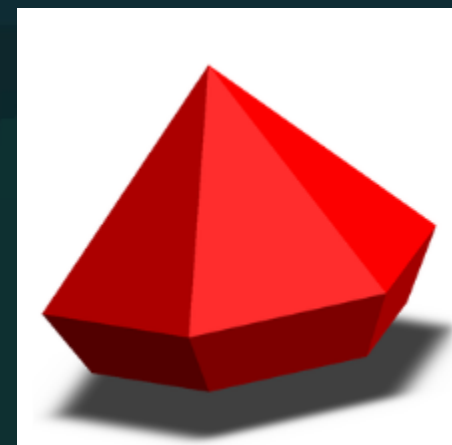
3D列印的步驟

繪圖

數位切片

傳送到3D印
表機

輸出產品



線上免費3D列印繪圖軟體 - Tinkercad

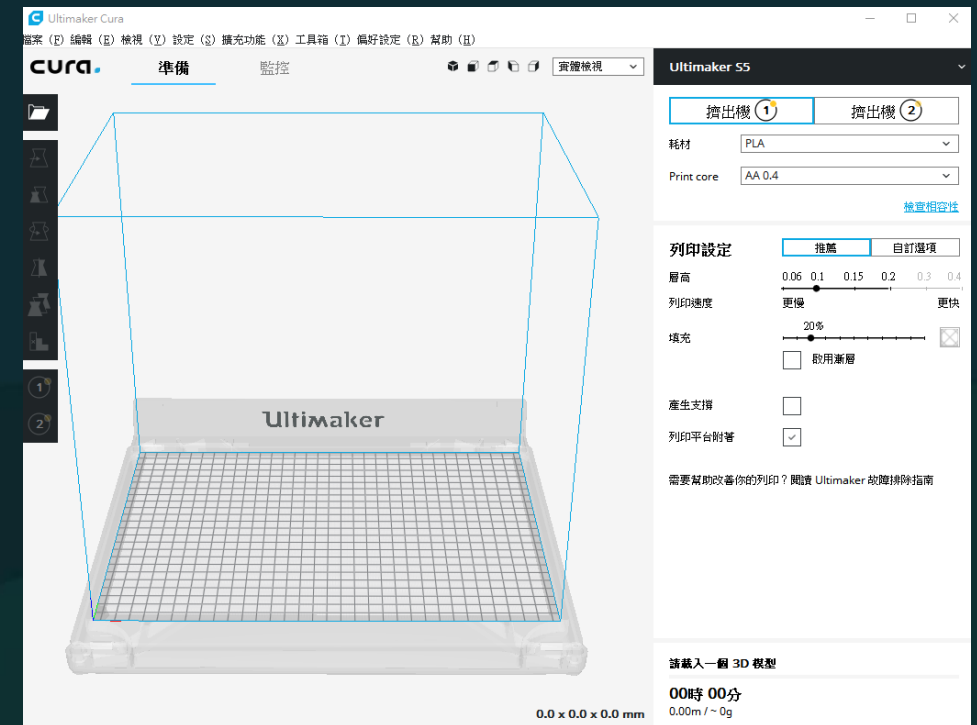
- 搜尋Tinkercad
- 用Google帳號登入



免費切片軟體

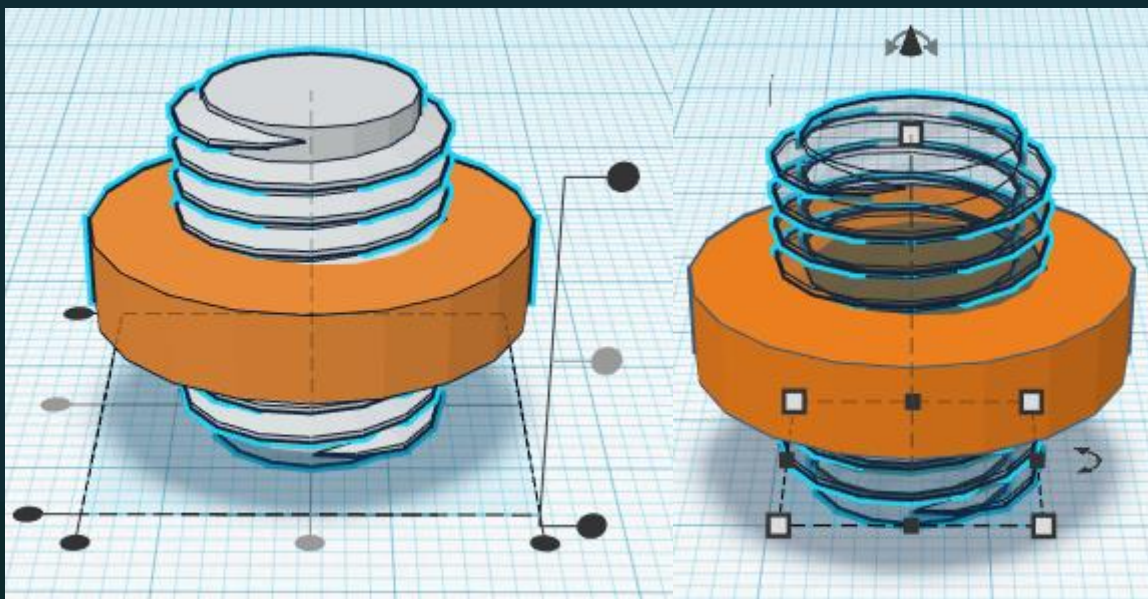


Google 搜尋切片軟體



切片軟體介面

3D列印實作



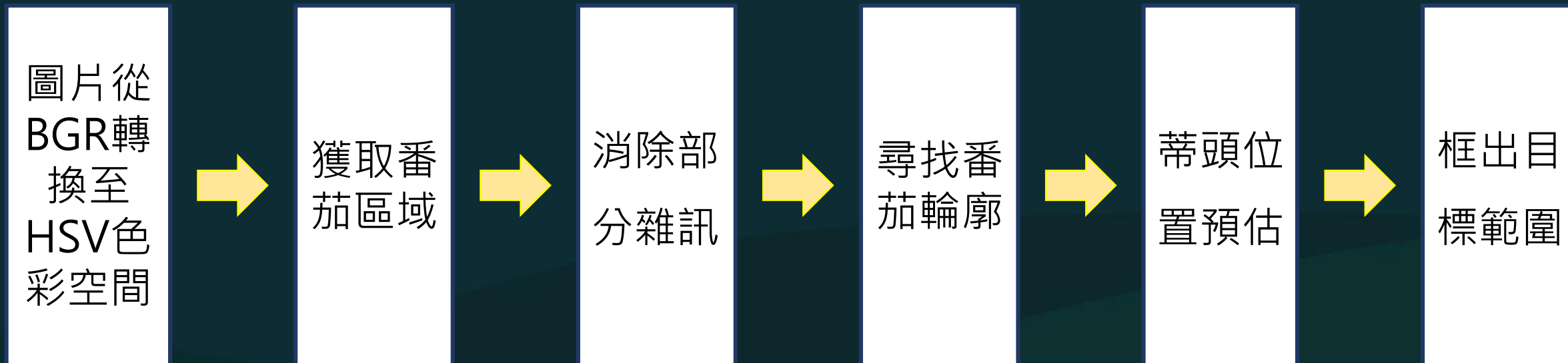
螺絲與螺母實作



輪胎實作



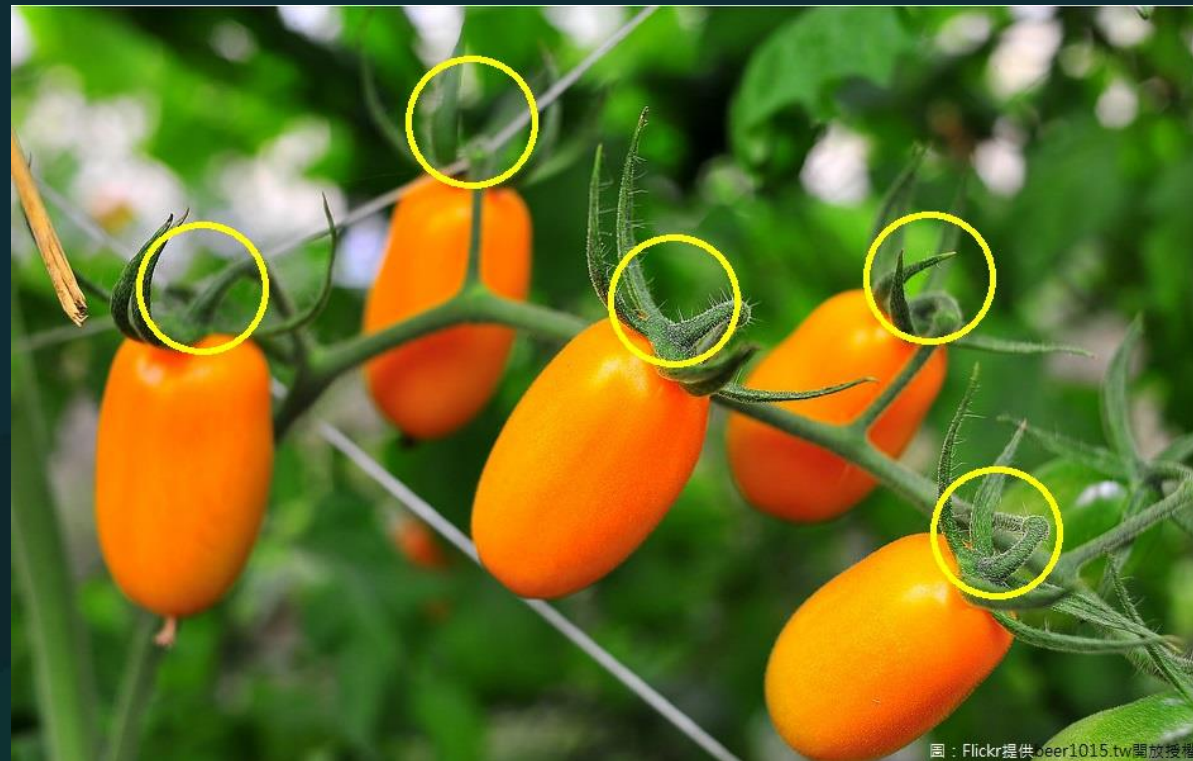
OpenCV 尋找番茄蒂頭



尋找蒂頭實作



尋找成熟番茄



尋找多顆番茄

