Embedded System Development and Applications

Lecture 01: Introduction

Bei Yu

Course Administration

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Grading Scheme

- This is a hands-on, lab-oriented course: Learning by doing!

- Grading scheme
  - Assignment & in-class exercises 15%
  - Lab (Starting from Week 3) 20%
  - Quiz (on Oct. 28) 25%
  - Final Project 40%
    - Proposal presentation on xx (10%)
    - Final demo on xx (30%)

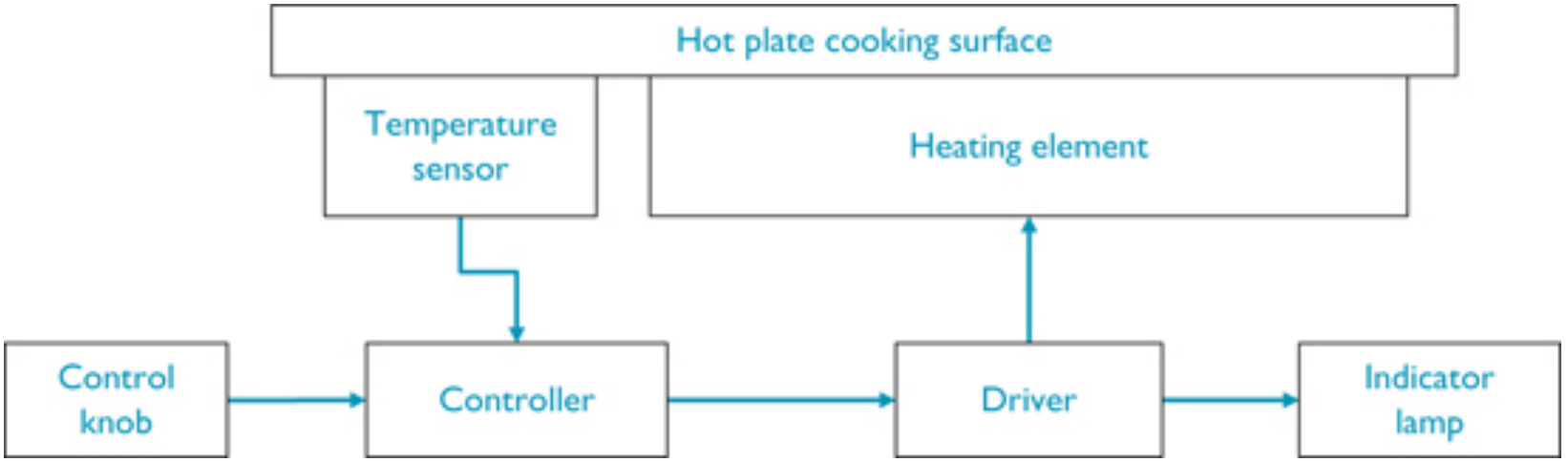
Academic Honesty

1. Zero Tolerance
   Plagiarism, cheating, misconduct in test/exam will be reported to the Faculty Disciplinary Committee for handling.
2. Penalty
   Zero marks for the concerned assignments/test/exam/whole course, reviewable demerits, non-reviewable demerits, suspension of study, dismissal from University.
3. University Guidelines to Academic Honesty
   http://www.cuhk.edu.hk/policy/academichonesty/

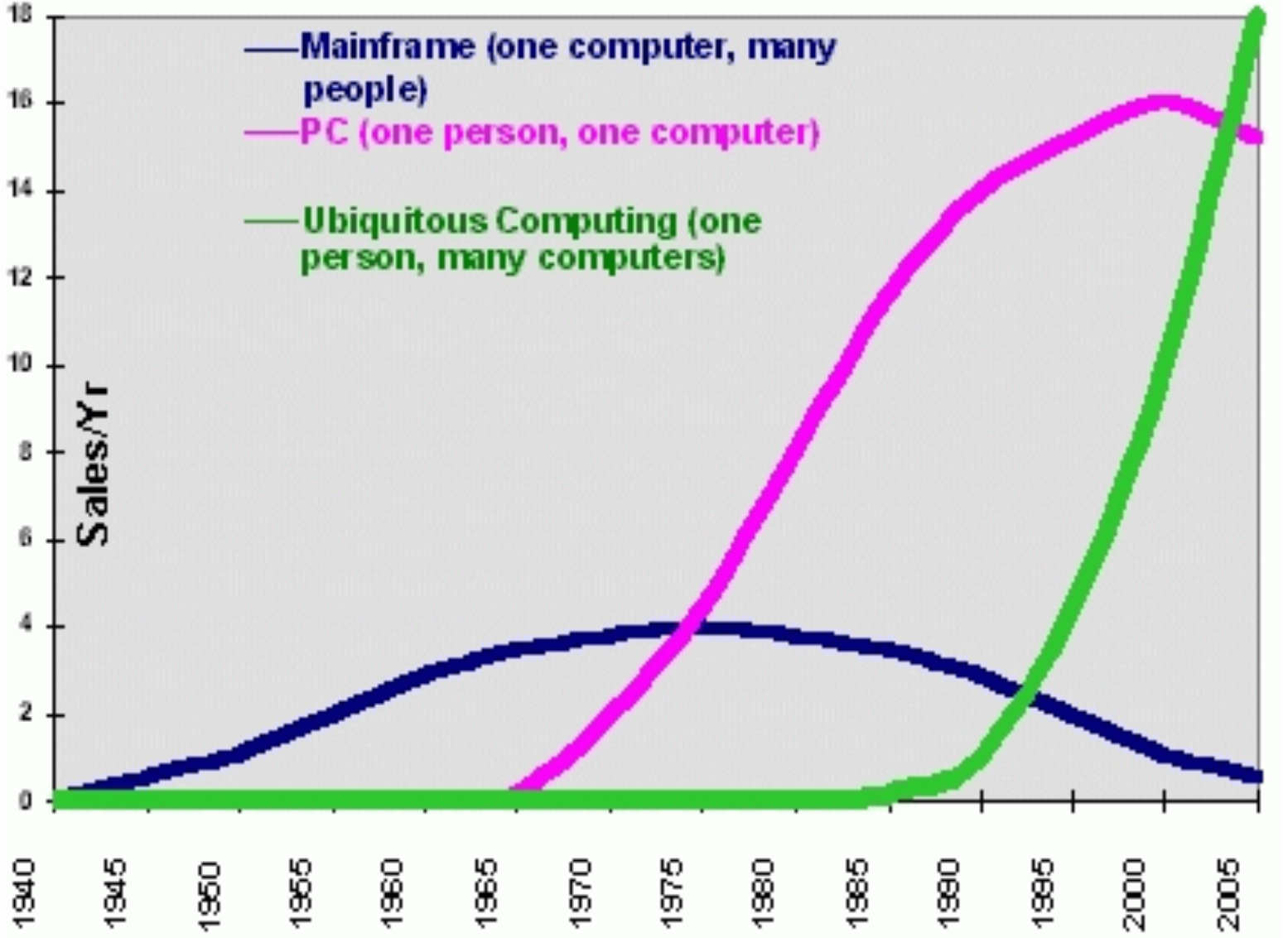
What You Should already Know

- Electronic theory and digital logic
  - Basic circuit laws and theorems
  - Number system
  - Boolean algebra
- Basic embedded system design
  - MCU/memory architecture
  - Interfacing techniques
  - Low-level C programming

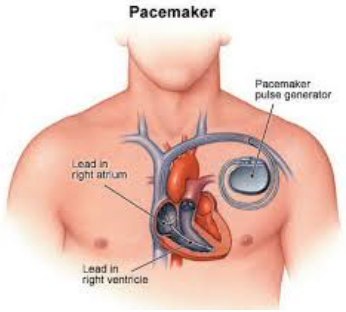
Embedded Systems

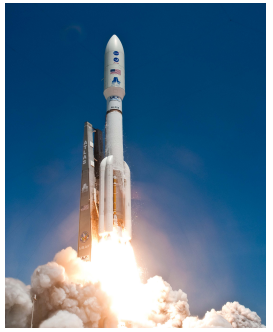


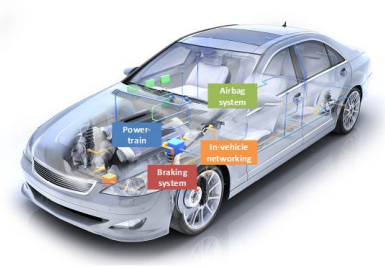
Weiser's 3 waves of computing



Embedded Systems





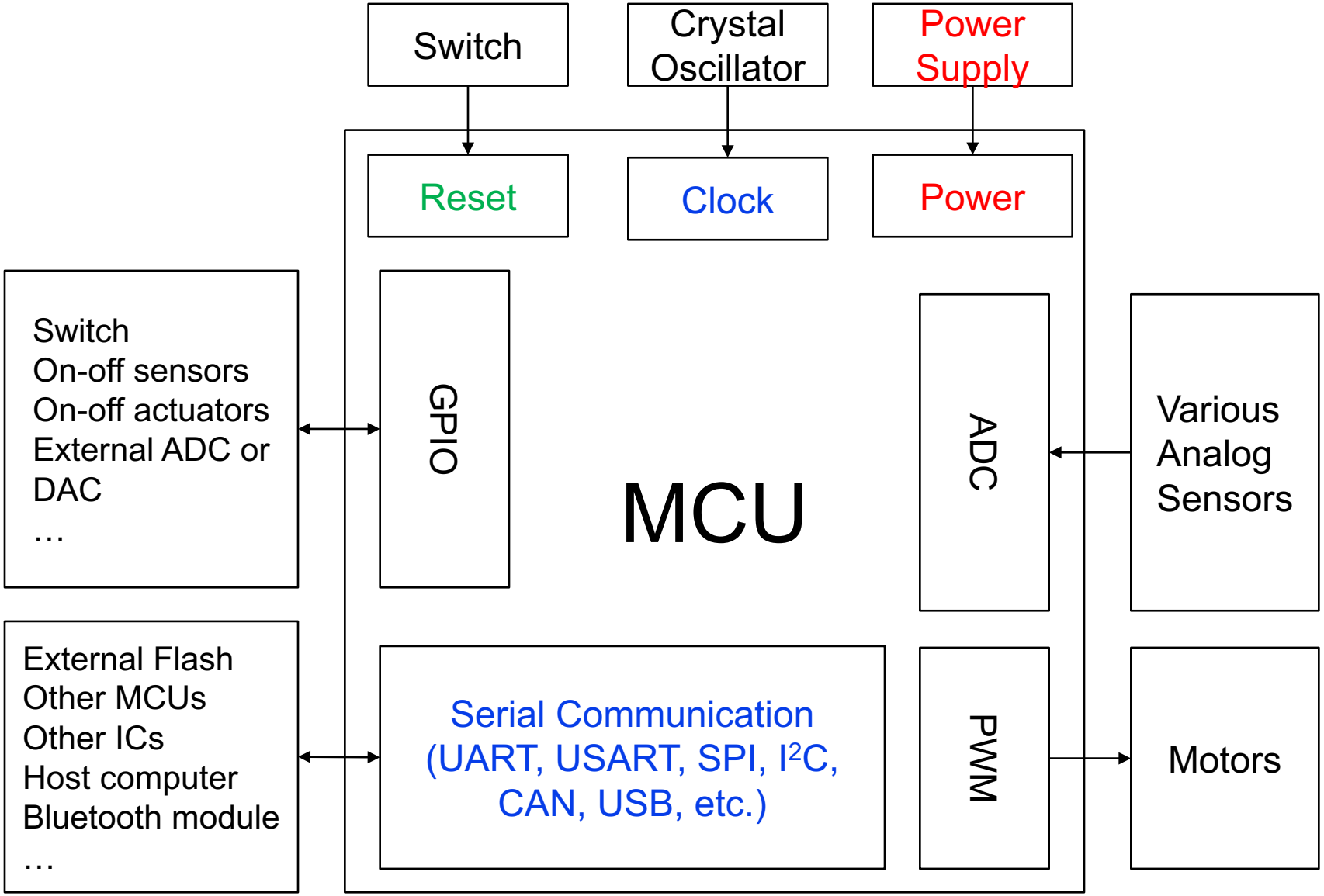


What separates them from general-purpose computers?

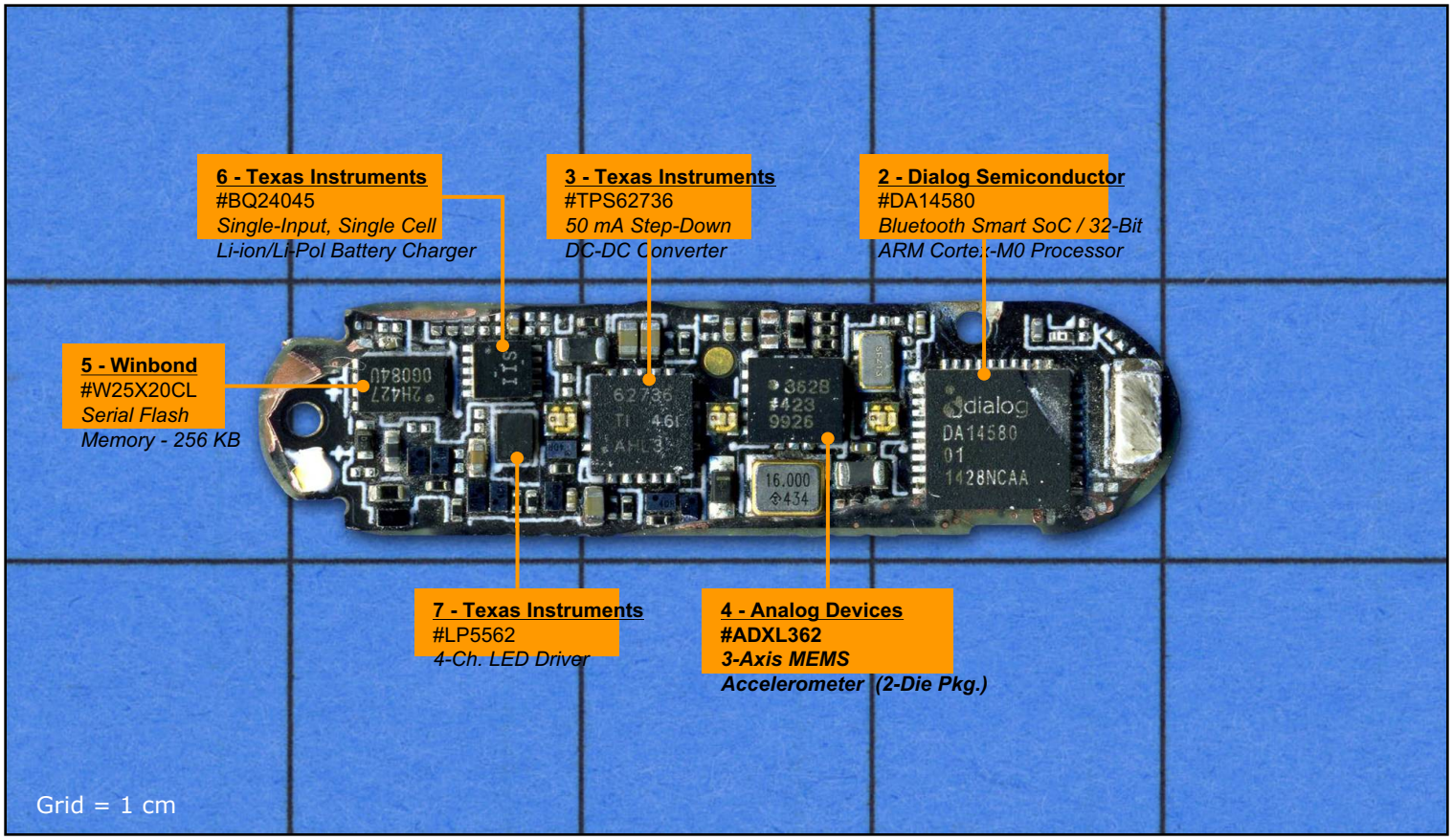
CENG2400 – Revisit Questions

- What is MCU? What components does it include?
- Name two serial communication protocols used in embedded systems.
- Compare interrupt- with polling-based designs.

Embedded Systems

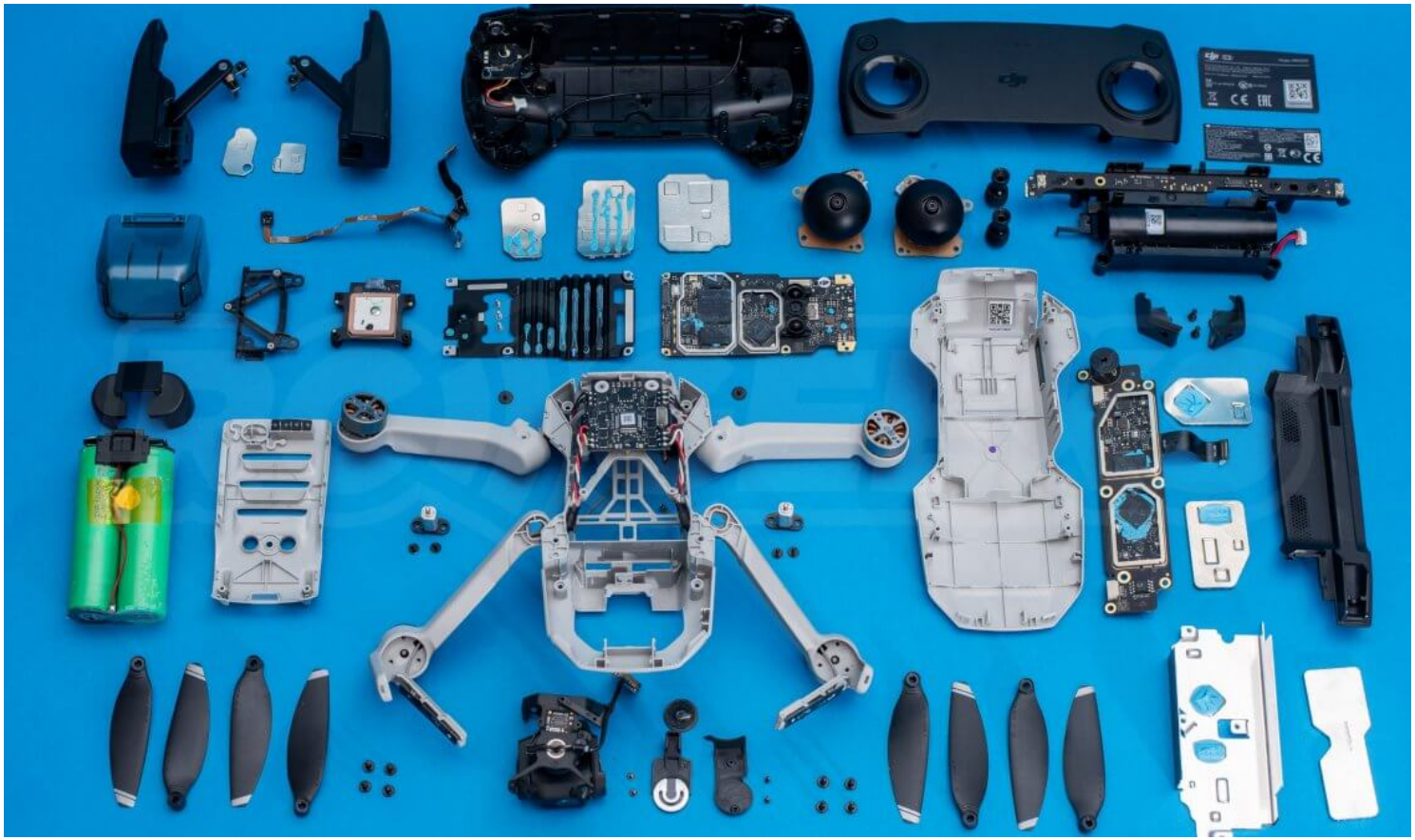


Mi Band System

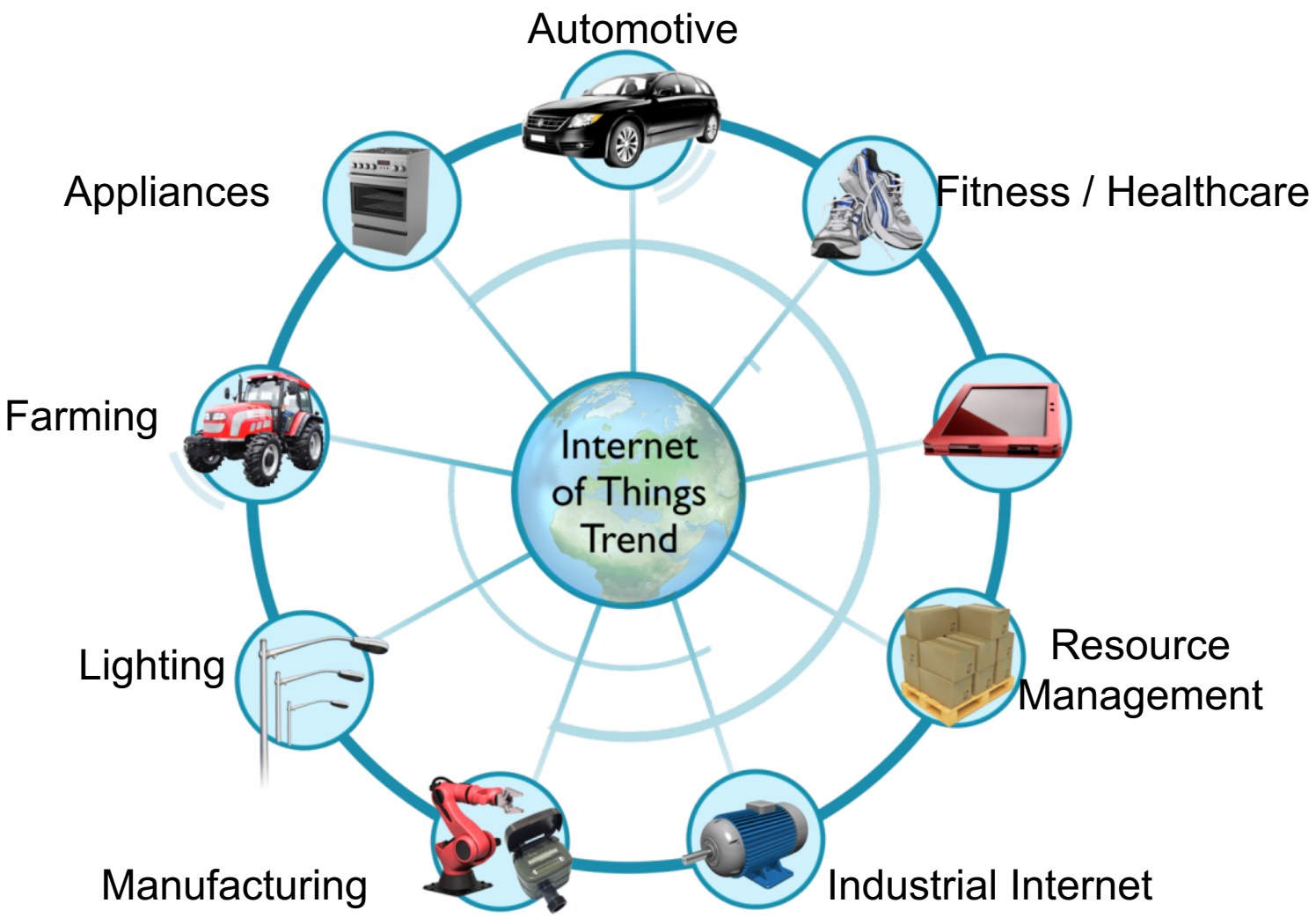


DJI Mavic Mini

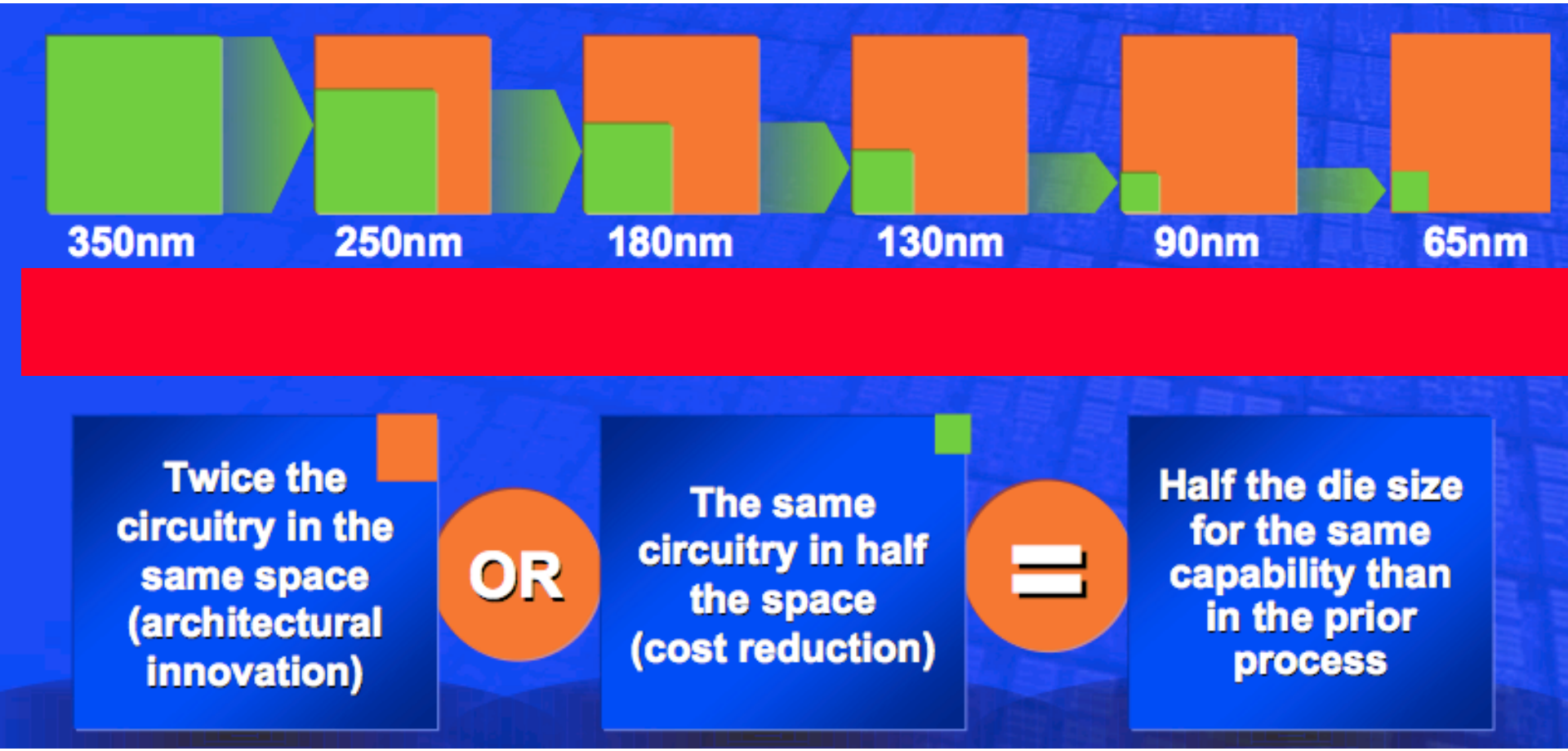
DJI Mavic Mini Teardown



Internet-of-Things (IoT)

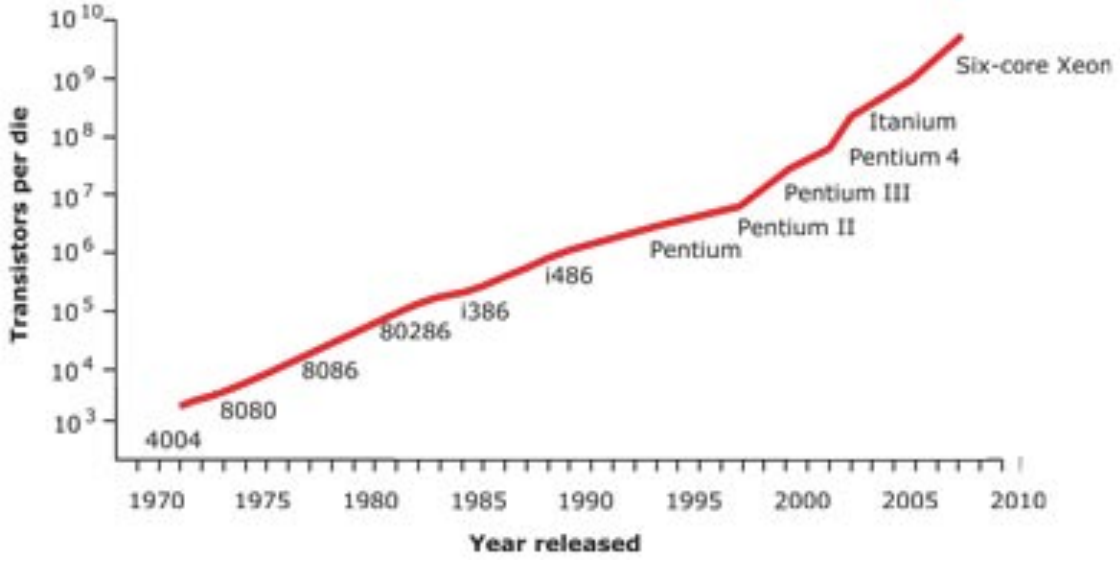


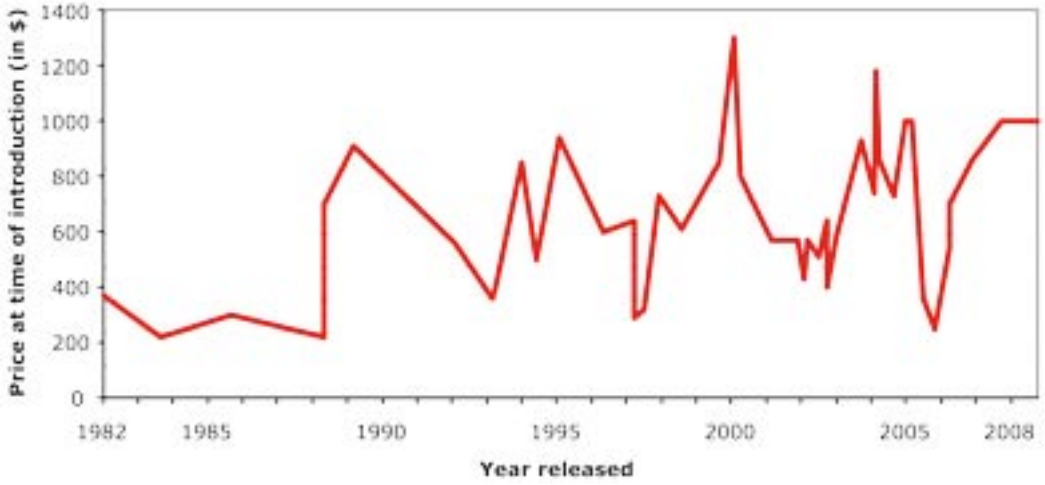
Main driver: device scaling ...



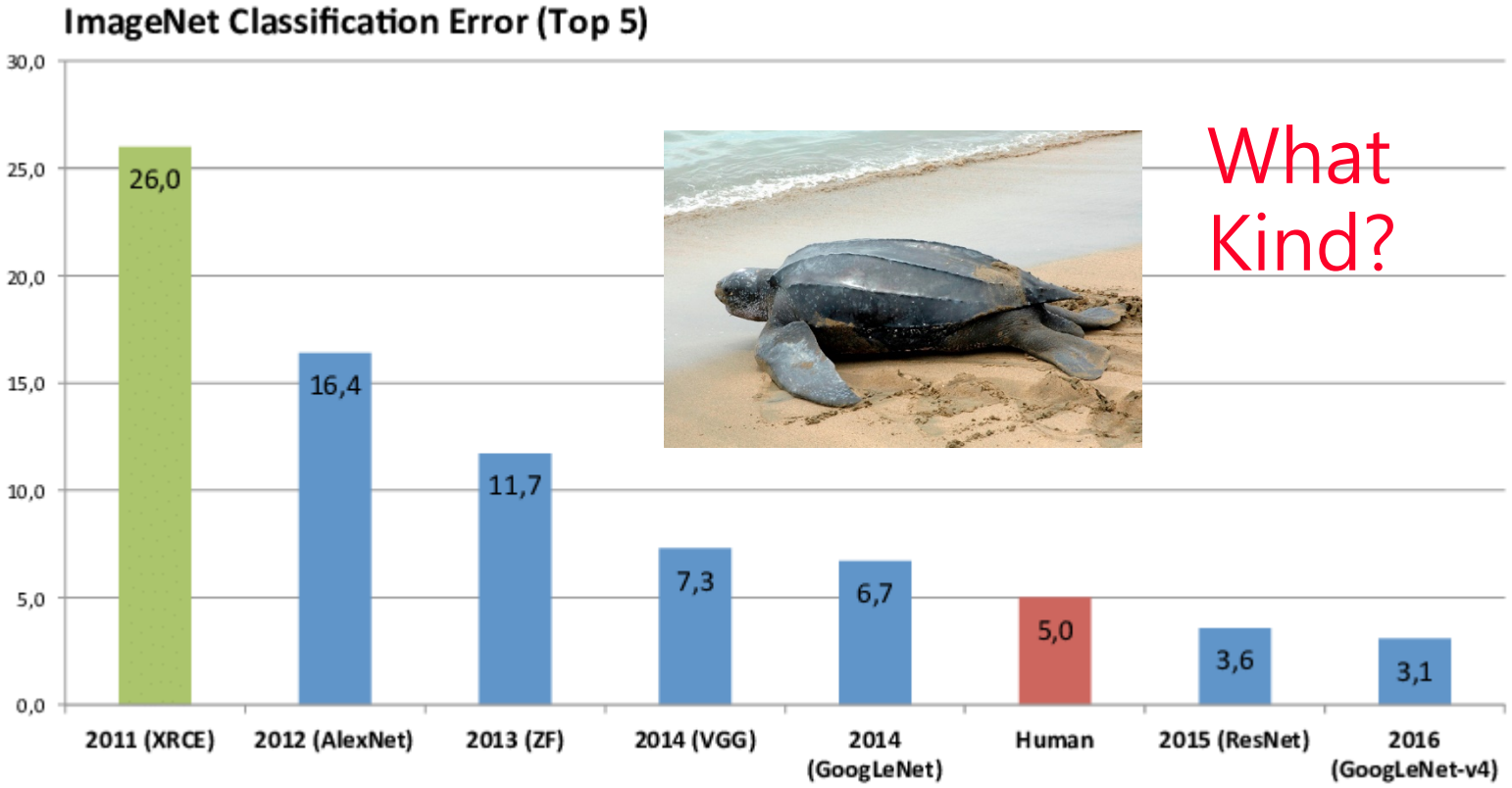
From: “Facing the Hot Chips Challenge Again”, Bill Holt, Intel, presented at Hot Chips 17, 2005.

Moore's Law on Intel Processor





Deep Learning – Exceeds Human Performance



Source of image: https://www.researchgate.net/figure/Winner-results-of-the-ImageNet-large-scale-visual-recognition-challenge-LSVRC-of-the_fig7_324476862

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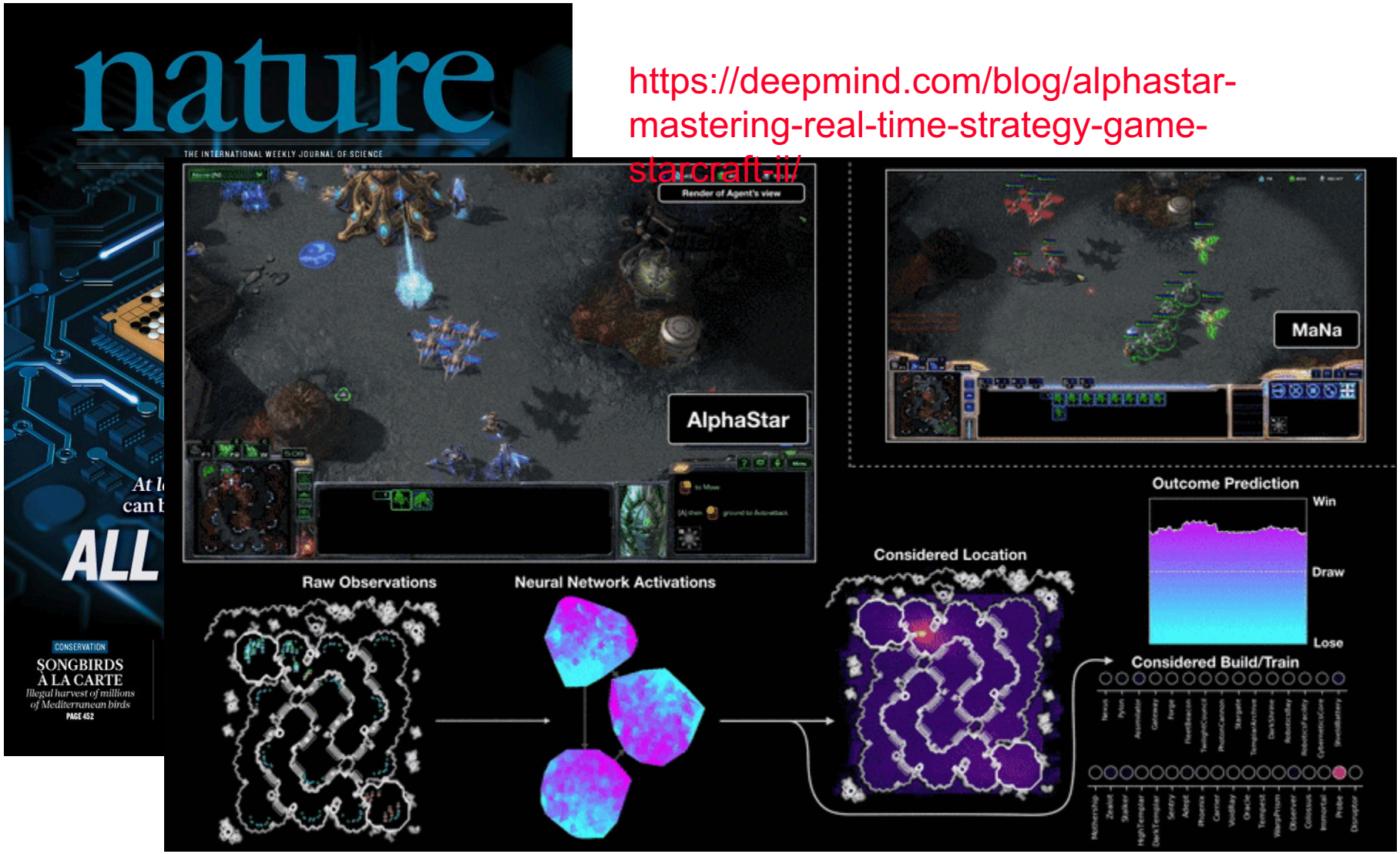
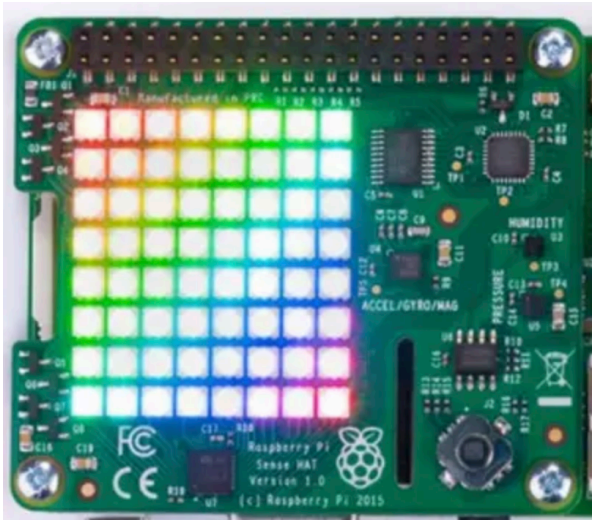


https://deepmind.com/blog/alphastar-mastering-real-time-strategy-game-starcraft-ii/

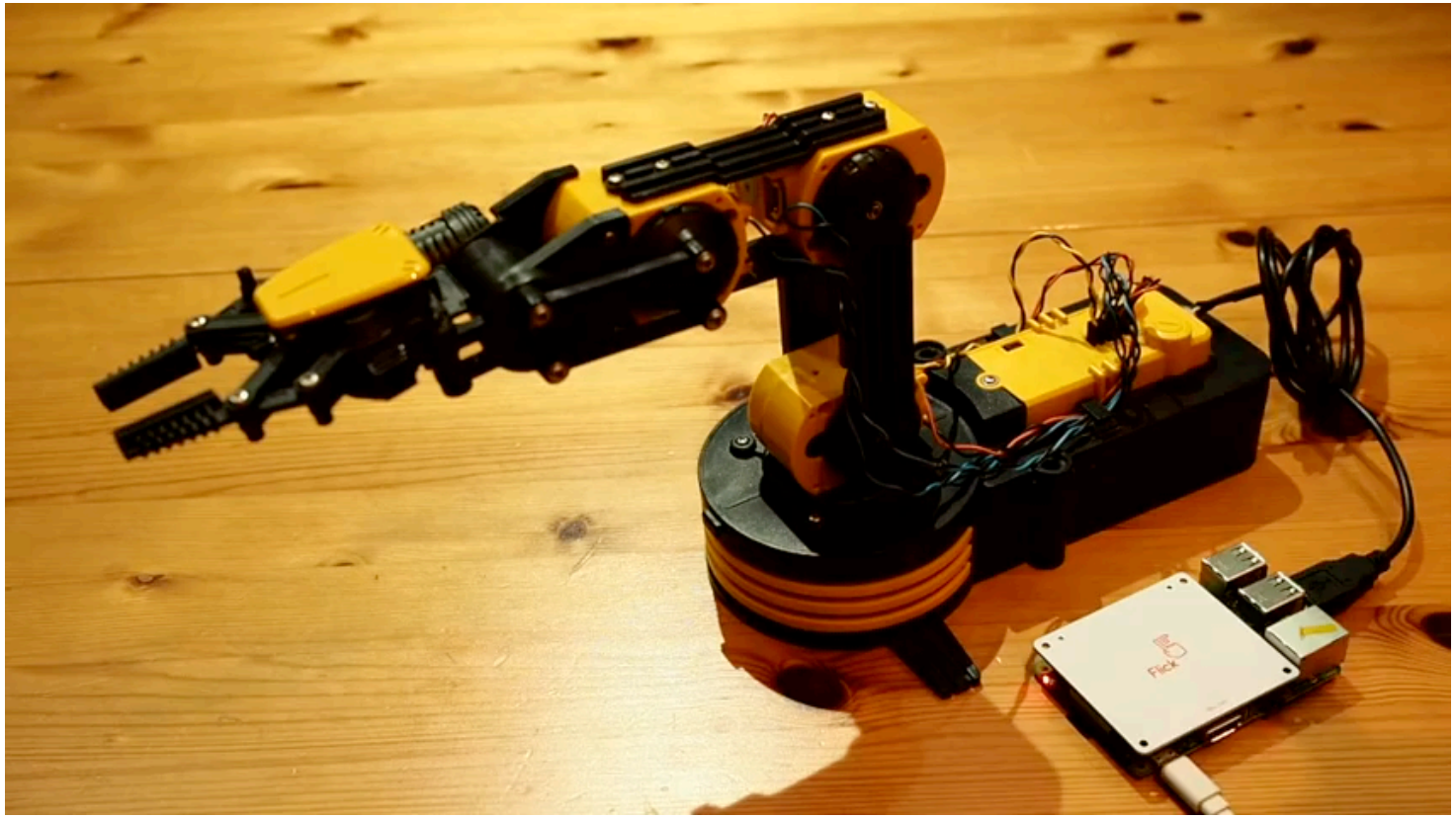
Course Contents

- Embedded system development
  - Embedded programming
  - OS and real-time concepts
  - Sensors and actuators
  - Embedded AI
- Hands-on labs
- Final projects

Development Board – Raspberry Pi



What can be Done with Pi?



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