

Embedded System

ERI PRASETYO WIBOWO

UNIVERSITAS GUNADARMA

<http://eri.staffsite.gunadarma.ac.id>

<http://pusatstudi.gunadarma.ac.id/pscitra>

Apa Itu Embedded System ?

A general-purpose definition of embedded systems is that they are devices used to control, monitor or assist the operation of equipment, machinery or plant. "Embedded" reflects the fact that they are an integral part of the system. In many cases, their "embeddedness" may be such that their presence is far from obvious to the casual observer.

Institute of Electrical Engineers (IEE)

Ringkasan Lainnya :

- Embedded system adalah ' A Special Purpose computer built into a larger device '.
- Special Purpose : - Embedded systems mempunyai tugas yang sangat spesifik.
 - Bandingkan dengan general purpose
- Built into a larger device, bagian dari piranti yang lebih besar untuk meningkatkan kapabilitasnya;

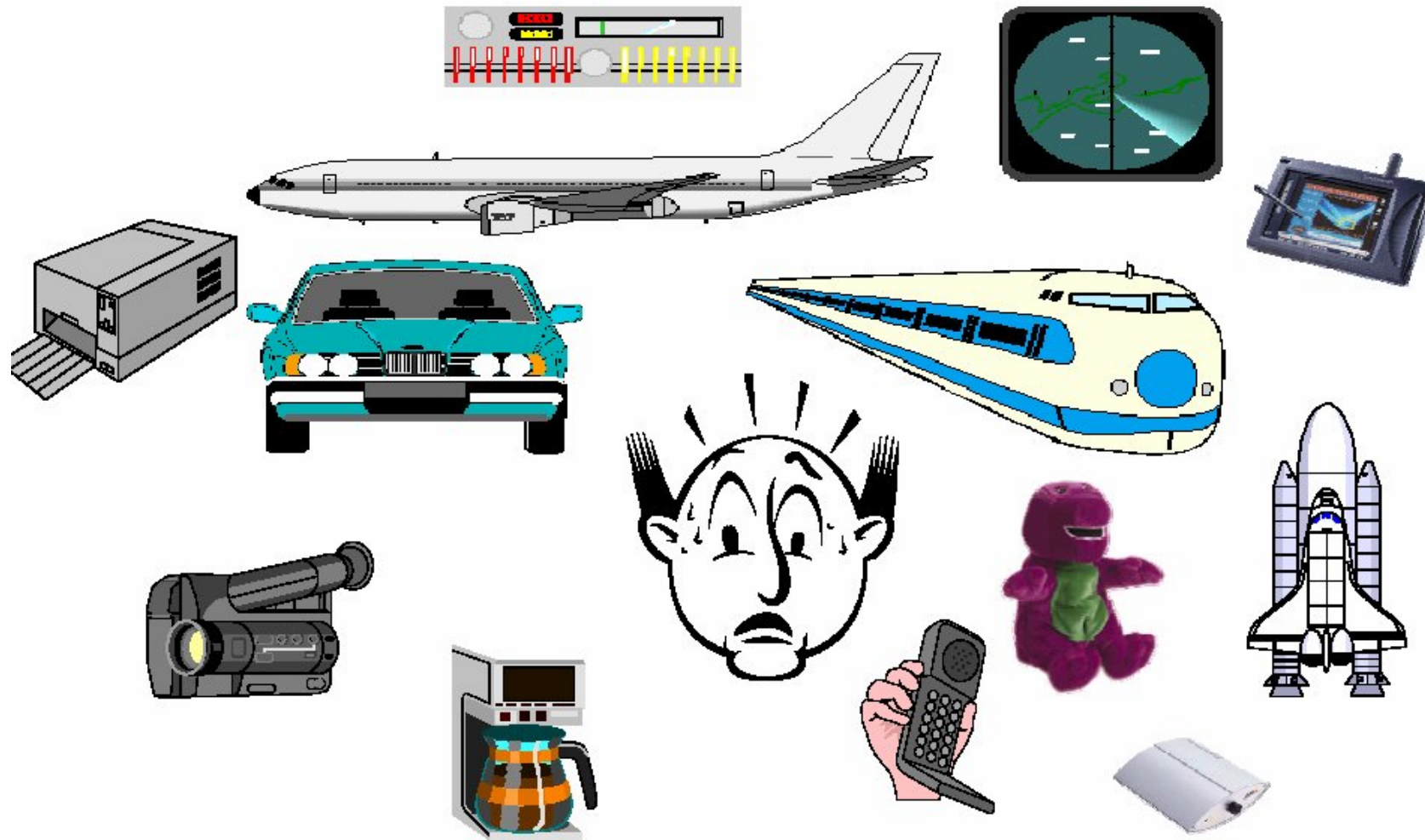
Sejarah

Embedded System pertama: Apollo Guidance Computer



<http://www.nasm.si.edu/nasm/dsh/artifacts/GC-ApolloBlock1.htm>

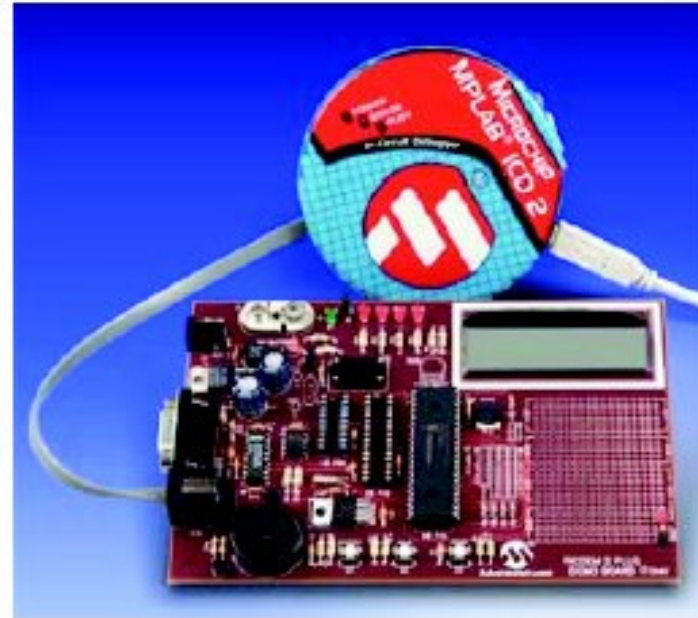
SAAT INI DAN MASA DATANG



EMBEDDED SISTEM SEDERHANA

Will use in the PICDEM2 board to

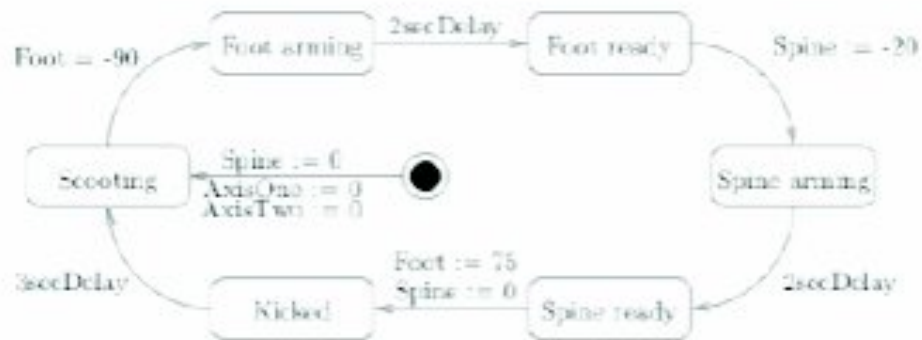
- Blink LEDs
- Control an LCD display
- Communicate via the serial line with a PC
- Communicate via the CAN protocol with other microchips
- Drive a stepper motor



Sebastian Fischmeister
sfischme@seas.upenn.edu

EMBEDDED SISTEM SEDERHANA (Cont)

- Control a modular robot:



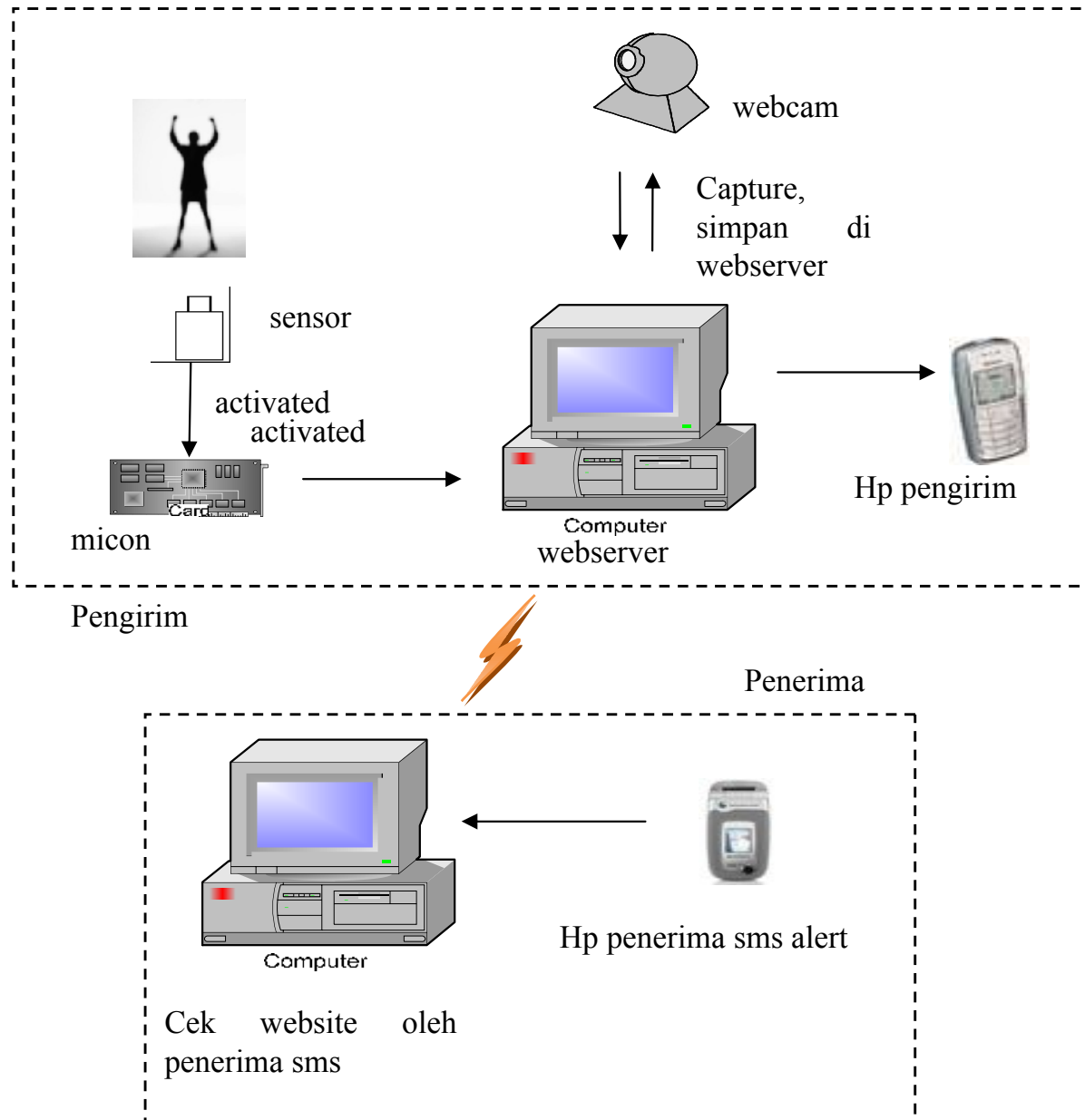
Sebastian Fischmeister
sfischme@seas.upenn.edu

Demo

Robot Mencari Api dan Memadamkan



Security System



- Tampilan website



EMBEDDED SYSTEM YANG BERJALAN SAAT INI

- Signal Processing systems
 - Real time video, DVD players, medical equipment, ...
- Distributed control
 - Network routers, switches, firewalls, elevator,
- Small Systems
 - Mobile phones, pagers, toys, smartcard, MP3 players, PDAs, Digital Cameras, Sensor,

KARAKTERISTIK EMBEDDED SYSTEMS

- Menjadi bagian dari sistem yang lebih besar
 - Periferal terbatas
- Application specific
 - H/W maupun S/W dirancang khusus untuk aplikasi yang spesifik
 - Perlu re-programmability
- Interaksi dengan dunia fisik

KENDALA - KENDALA

- Hardware

- CPU, Memory
- Power consumption
- Limited peripheral and slower buses
- Size, weight,

- Software

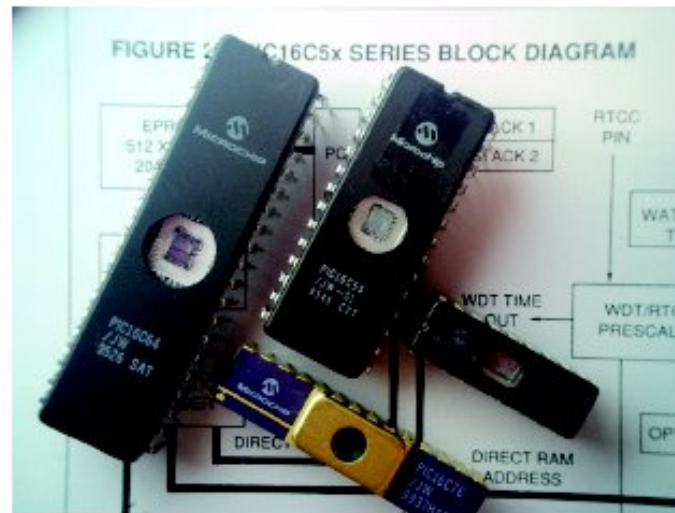
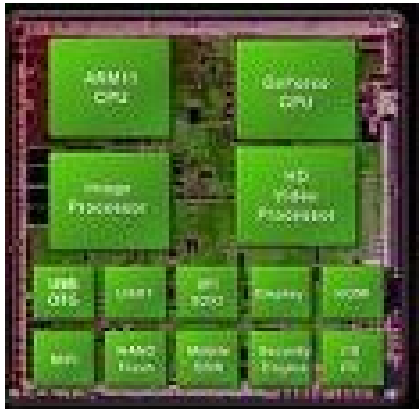
- Latency , real time requirements
- Limited H/W resources
- Reliability, tidak mudah di debug
- Device heterogeneity , interoperabilitas isu penting

EMBEDDED SISTEM DI HARDWARE

- Commercial off-the-shelf component (COST)
 - misal, wireless radio, sensor, I/O device
 - murah
- Application spesifik ICs (ASICs)
 - ICs yang dirancang untuk keperluan aplikasi khusus
 - Kinerja yang sangat bagus pada aplikasi
- Domain Spesifik prosesor
 - DSP
 - Mikrokontroler
 - Mikroprosesor

TREND EMBEDDED SISTEM PADA HW

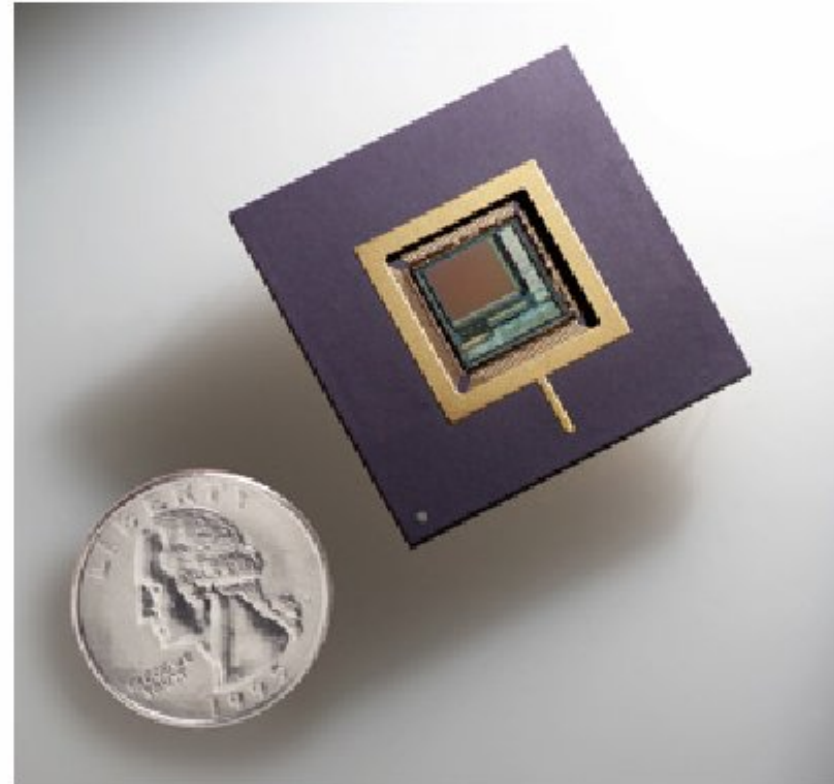
- System On Chip (SOCs)
 - Perubahan peripheral sangat cepat , luar biasa



<http://images.google.co.id/images>

SMALL SOCs

- Camera-on-chip
(Bell Labs)
- CMOS-based
- 100,000 optical sensors in a 2D grid
(active pixels)
- Daya sangat rendah
- Murah (~\$50)



<http://www.bell-labs.com/news/1998/july/15/1.html>

LANJUTAN

- SPEC: one step closer to “Smart Dust”
 - 2mm x 2.5 mm
 - AVR-like RISC core
 - 3k RAM
 - 8-bit ADC
 - FSK radio transceiver
 - Paged memory system
 - Lots of other cool stuff...
- Manufacturing cost
 - \$ 0.3 for the die
 - \$ 0.5 for the five external components (antenna, crystals, power source etc)



<http://www.cs.berkeley.edu/~jhill/spec/>

RSOCs (RECONFIGURABLE SOCs)

- Reconfigurable System-on-Chip
 - Processor core + (re)Programable logic
 - E.g. FPGAs
 - Merubah watak/perilaku sistem *at the hardware level*
 - Contoh:
 - Atmel's FPSLIC
 - Up to 40K Gates
 - 8-bit microcontroller @ 40 MHz
 - Triscend's A7S
 - Up to 40K Gates
 - ARM-based

<http://www.atmel.com/products/FPSLIC/>

<http://www.triscend.com/products/a7.htm>

EMBEDDED SOFTWARE

- Tugas utama : bukan sebagai transformasi data tetapi berinteraksi dengan sarana fisik.
- mengakuisisi sifat-sifat kimia / kimia lingkungan
 - Perlu waktu
 - Konsumsi daya
 - tidak berhenti