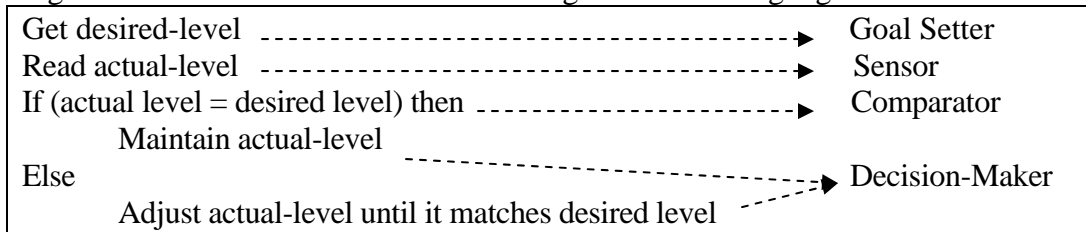# A U T O M A T I O N

Given: A repetitive task.
Issue: should its execution be delegated to a machine? (= Automation)

Explore if the task CAN be automated from a technical viewpoint

Figure out the structure of the task according to the following logic:

Get desired-level ------------------------------>	Goal Setter
Read actual-level ------------------------------>	Sensor
If (actual level = desired level) then --------------->	Comparator
Maintain actual-level	
Else ---------------------------->	Decision-Maker
Adjust actual-level until it matches desired level	

Determine the type of function to be automated

- Automated input (Caller ID, Speech Recognition, Biometrics, webcam, …)
- Automated processing
- Automated output (Audio Output, Robotics, …)

Explore if the task SHOULD be automated from an economic viewpoint

	Fixed Cost	Variable Cost
Manual	*LOW* • Training	*VERY HIGH* • Payroll
Automated	*VERY HIGH* • Hardware • Software • Communication • Training	*LOW (?)* • Maintenance • Upgrades

Advantages	Disadvantages
Next	*Page*

Calculate the amount of time it takes for automation to pay for itself

The old system needed 5 clerks. The new system costs $30,000, and needs only 2 people. Each clerk is paid $20,000/year. How long will it take for the system to pay for itself?

$$\text{Payback Period} = \frac{\text{Fixed Cost}}{(\text{Cost Savings or Revenue Enhancement})/\text{time period}}$$

Is the payback period acceptable?

Explore if the task SHOULD be automated from a

- social viewpoint (Are the impacts of automation on people acceptable?)
- marketing viewpoint (Does "automated" have a positive image associated with it?)
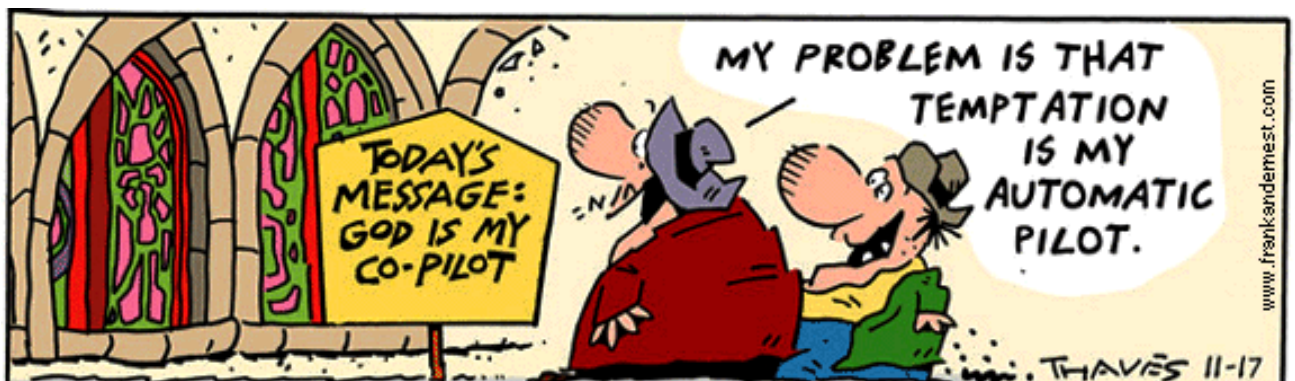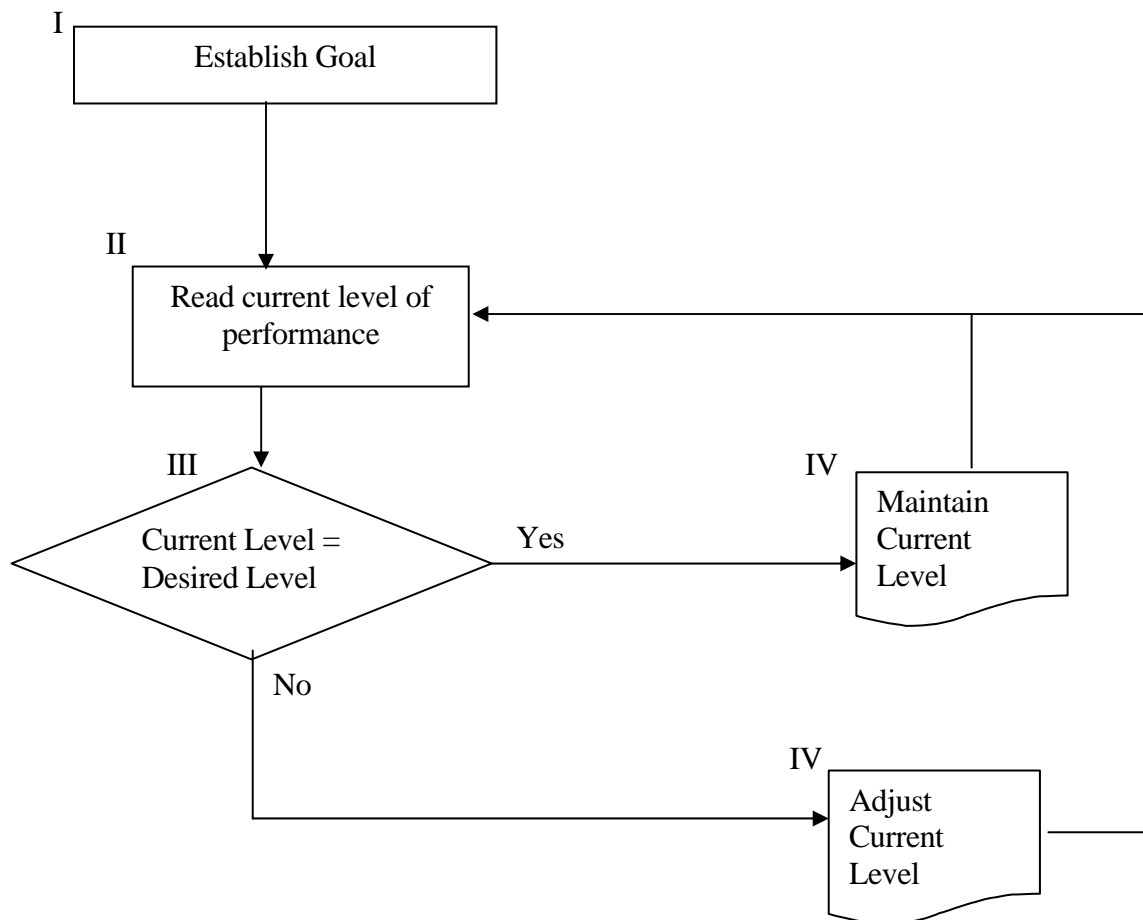
http://en.wikipedia.org/wiki/Automation
http://en.wikipedia.org/wiki/Domotics
http://www.domotics.com

Automation Advantages and Disadvantages

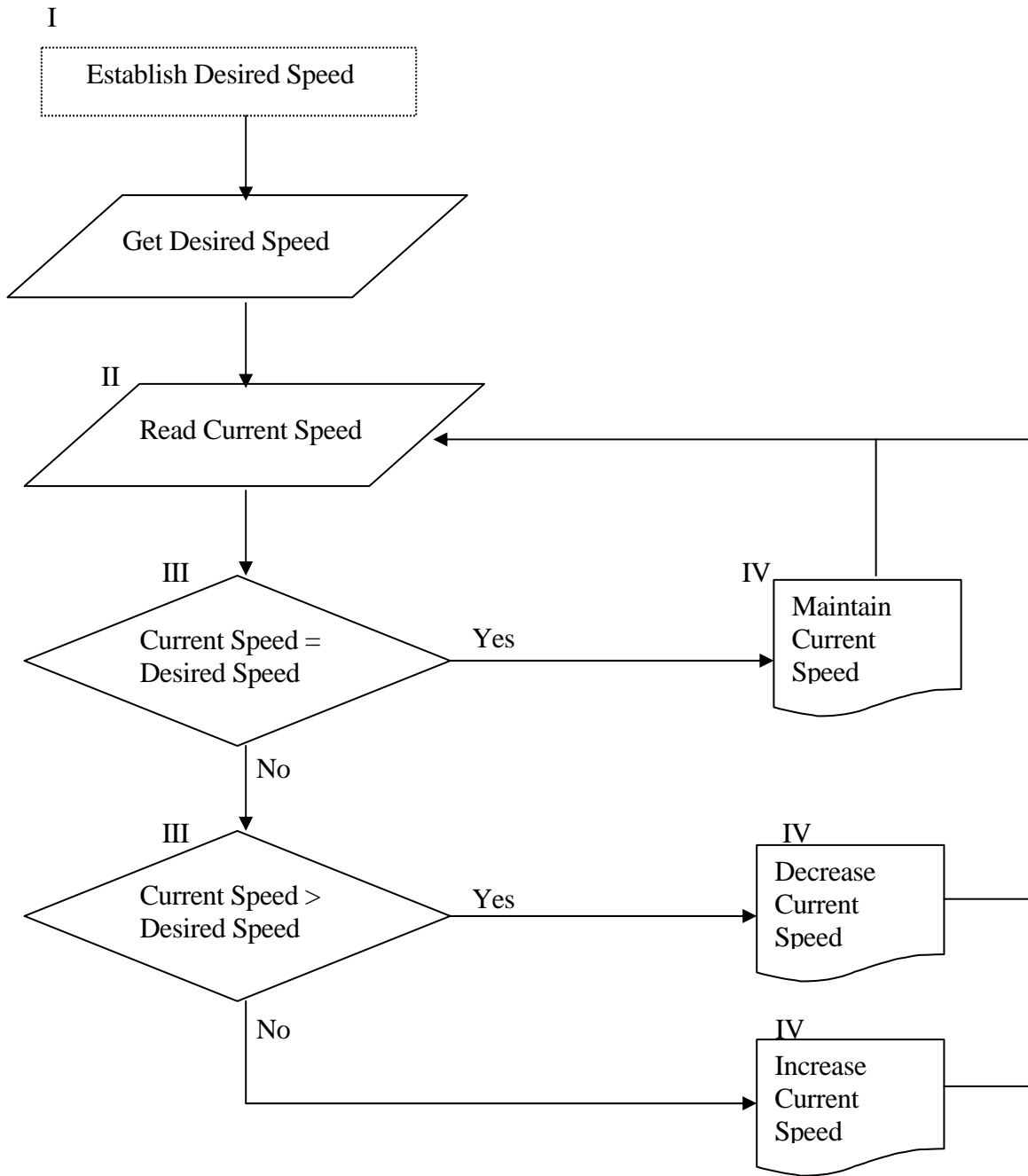| Advantages	Disadvantages
Speed Accuracy Availability • Convenience • Productivity Long-Term Cost Reduction (?) Privacy (?)	Limited Application Scope Inability to Handle Exceptions • "smart" = stupid! Lack of Security Heavy Upfront Investment

The Technical Logic of Automation

Components of an automated system:

I. **Goal setter** (defines the desired state of the system; set by humans and stored in the system)
II. **Sensor** (keeps receiving information from the external environment about the current level of performance of the system)
III. **Comparator** (compares the system's current state vs. desired state)
IV. **Decision maker** (issue a command depending on the outcome of the comparison)

I
```
Establish Goal
```

II
```
Read current level of
performance
```

III
```
Current Level =
Desired Level
```
  — Yes →

IV
```
Maintain
Current
Level
```

No

IV
```
Adjust
Current
Level
```

The Logic of ....?

I

Establish Desired Speed

Get Desired Speed

II

Read Current Speed

III

Current Speed =
Desired Speed → Yes →

IV

Maintain
Current
Speed

No

III

Current Speed >
Desired Speed → Yes →

IV

Decrease
Current
Speed

No →

IV

Increase
Current
Speed

The Structured English Version

GET desired-speed

DOWHILE in operation

    READ current-speed

    IF current-speed = desired-speed THEN
        Maintain current-speed

    ELSE (* traveling too fast or too slow *)

        IF current-speed > desired-speed THEN

            DOUNTIL current-speed = desired-speed
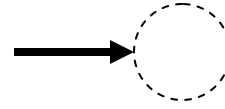   Decrease current-speed
            ENDDO

        ELSE (* traveling too slow *)
            DOUNTIL current-speed = desired-speed
                Increase current-speed
            ENDDO
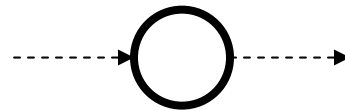   ENDIF

    ENDIF

ENDDO

The Phases of Automation

AUTOMATED INPUT

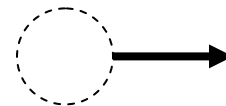Receiving input from the external environment without any human intervention

- Caller ID
- Speech Recognition
- Biometrics
- …….

AUTOMATED PROCESSING

Transforming inputs to outputs without any human intervention

AUTOMATED OUTPUT

Producing output for the external environment without any human intervention

- Audio output
- Robotics
- ………..

Is all automation high-tech?