

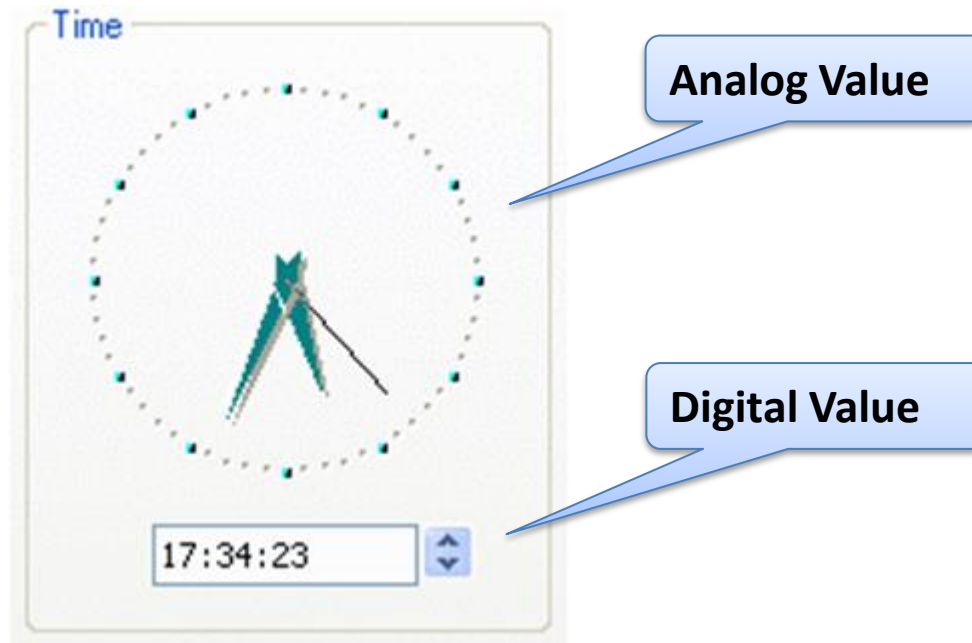
Analog and Digital

Digital Electronics

Wolfgang Neff

Analog and Digital (1)

- There are analog and digital Values



Analog and Digital (2)

- Analog Values
 - They are physical quantities
 - They have a magnitude and a unit
 - They can be measured
 - They are concrete
 - They exist in the real world
 - Their accuracy is not limited
 - A year has 365.256363004... days

Analog and Digital (3)

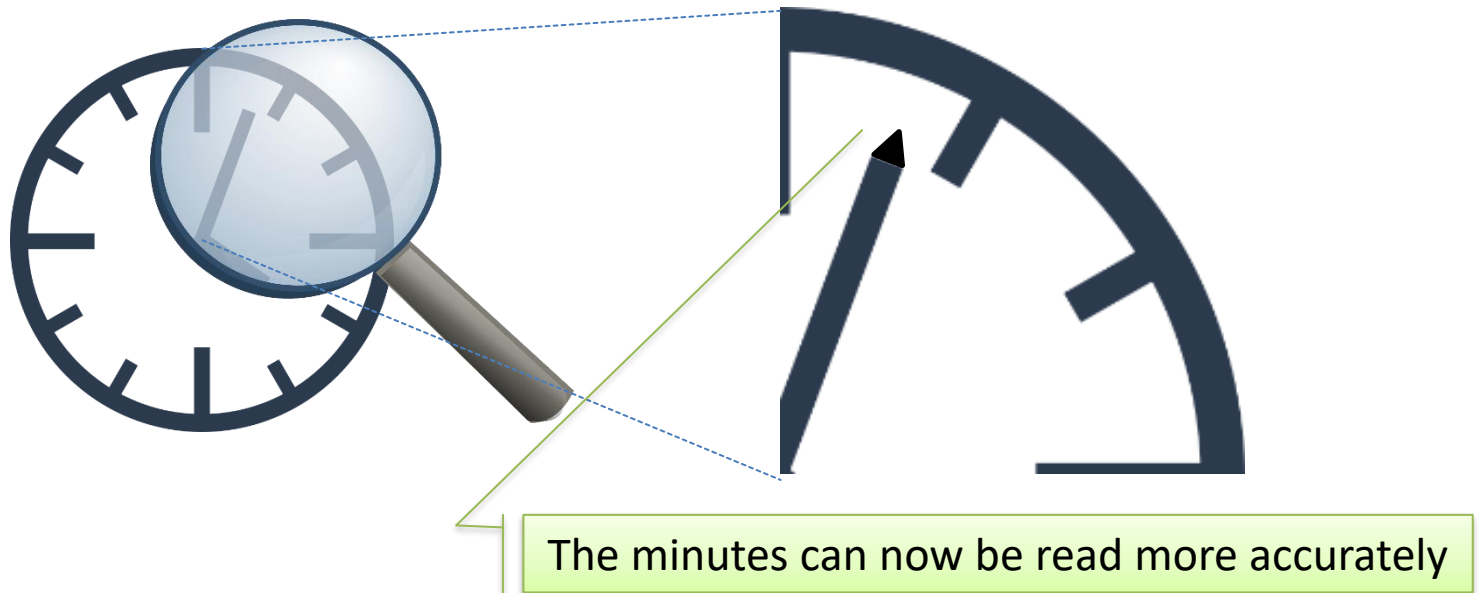
- Clock Example

- The position of the hands indicates the time
- To read the clock the angle of the hands are measured
- The unit of an angle is degree ($^{\circ}$) or radian (rad)
 - But on a clock the units are hours
 - ... luckily 😊



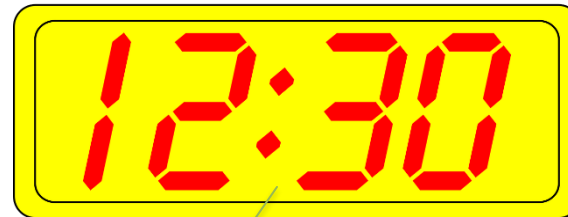
Analog and Digital (4)

- Clock Example
 - On principle there is no limit in accuracy



Analog and Digital (5)

- Digital Values
 - They are numbers
 - They have no unit
 - They are read
 - They are abstract
 - They are not real
 - They exist in mind, only
 - They are discrete
 - They proceed in steps



Only minutes can be read. Time proceeds in steps. The maximum accuracy is minutes.

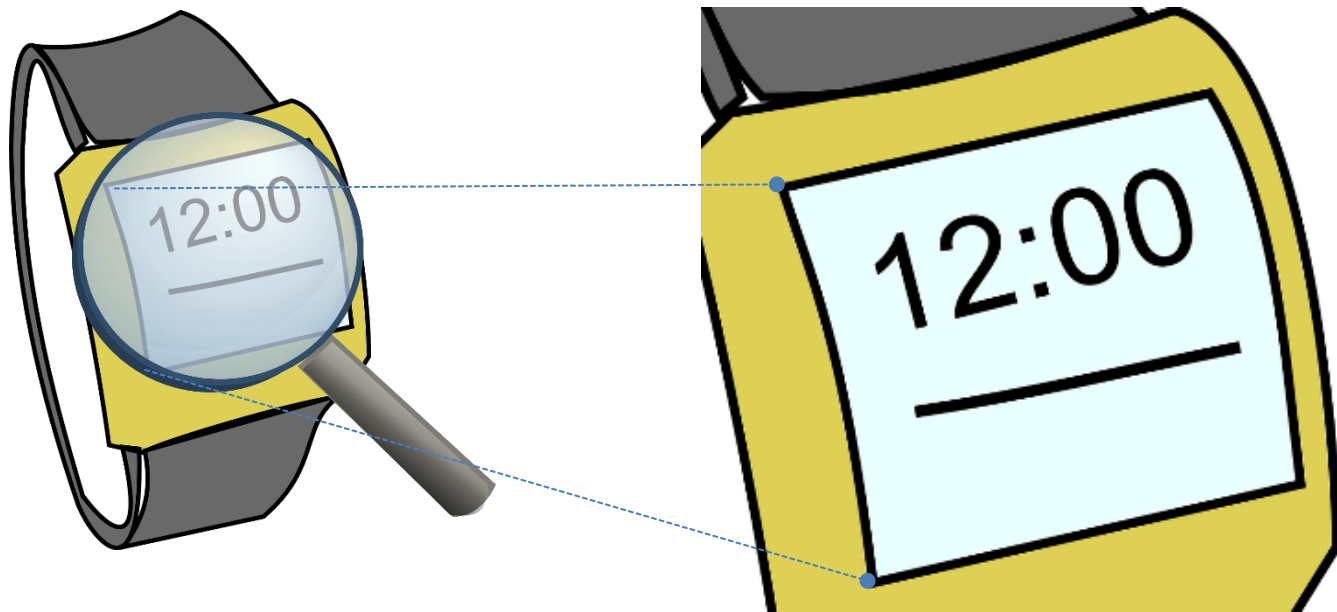
Analog and Digital (6)

- Clock Example
 - The numbers show the time
 - They have to be read not measured
 - The units have to be known
 - The format is hh:mm
 - Only hours and minutes are shown
 - The accuracy is one minute



Analog and Digital (7)

- Clock Example
 - The accuracy can not be increased

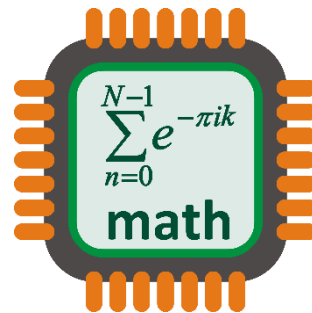
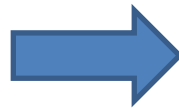


Analog and Digital (8)

- A computer converts the value
 - A sensor detects the physical value
 - The computer calculates the number
 - The actuator displays the number



Sensor



Microprozessor



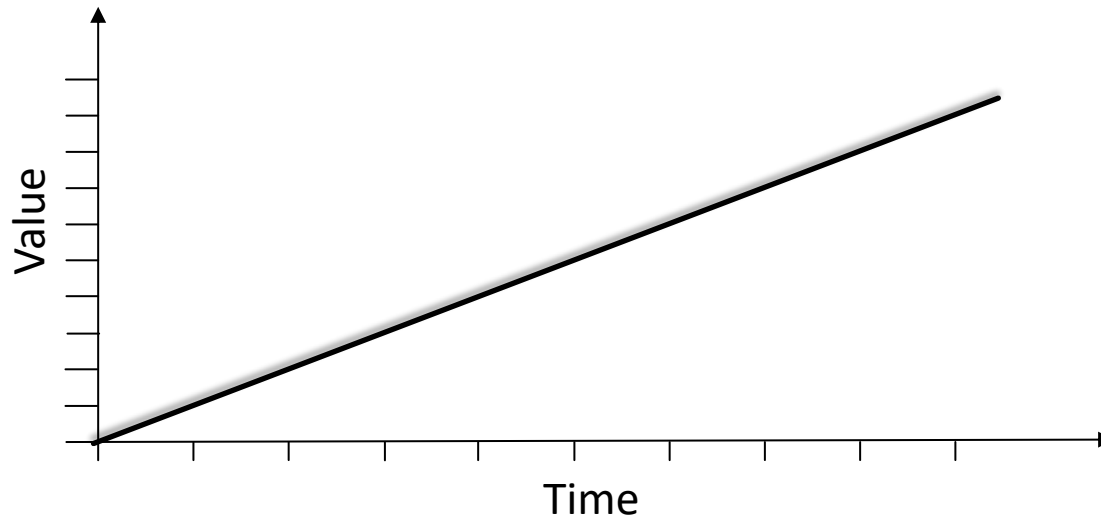
Actuator

Analog and Digital (9)

- Digital Circuits
 - They operate on two signals
 - Plus (+) or Minus (-)
 - High or low voltage
 - One (1) or zero (0)
 - They work in a binary manner
 - How can the other numbers be represented?
 - See number systems

Analog and Digital (10)

- Analog Signals
 - Every value is possible
 - They are continuous
 - Their curves are smooth



Analog and Digital (11)

- Digital Signals
 - They are discrete
 - Their curves have steps

