RTS Lab 1 Protokoll

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1 Aufgabe 1

Calculation of Times and Deadlines in the physical world.

1.1 Time calculations

Formula for Speed: $s = v * t$

s	distance in Meter[m]
v	speed in meters per second [m/s]
t	time in seconds [s]

1.1.1

How long does it take a Car to travel the distance of 1 m when travelling 30/50/100/200 km/h ?

Rearrange formula to get s/m: $\frac{1}{\frac{10}{36} * s * \frac{h}{Km} * \frac{m}{s}}$

For s use speed in Km/h:
$30km/h = 0,12s/m$
$50km/h = 0,072s/m$
$100km/h = 0,036s/m$
$200km/h = 0,018s/m$

1.1.2

How far does a missile at mach 3 flys in 1ms?
mach = 1234,8 Km/h

mach 3 = 3704,4 Km/h Formular to get m/ms : $\frac{10}{36} * s * \frac{h}{Km} * \frac{m}{1000ms}$

3704,4km/h = 1,029 m/ms

1.1.3

Which distance travels a light ray in vacuum?
Speed of light = $3x10^8 m/s$

Formula to get m/ns: $s * \frac{m/s}{1x10^9 ns}$
$3x10^8 m/s = 0,3 m/ns$

1.1.4

Formula for frequency: $f = \frac{1}{T}$

f	frequency[Hz]
T	Period time [s]

$0,3m/1,5x10^8 m/s = 2x10^-9 \ \frac{1}{2x10^-9} = 500mHz$

1.1.5

Shannons theorem states, to sample a signal the sampling rate: Ts must be smaller then the $T/2$ where T is the Frequency of the Signal. Otherwise it is impossible to reconstruct the original Signal.
Therefore the sampling rate for a 3,2 kHz Signal must be at least greater as 6.2 kHz.
$\lfloor \frac{16mHz}{6,2kHz} \rfloor = 2580 Cycles$

2 Cyclic Executive Approach

2.1

The major cycle is calculated by the Least common multiple of the Processes execution times.
$Lcm(25, 50, 100) = 100$
The Major cycle is thereby 100.

The minor cycle is determined by the smallest execution time.
The minor cycle is 25.

2.1.1

In the Figure 1 the RTS for the Process Table is shown in a Linear fashion.

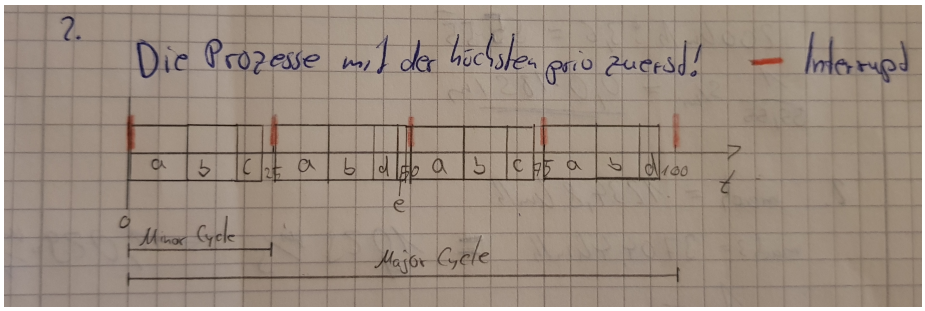

Figure 1: RTS Graph

2.1.2

```
loop
        wait_for_interrupt(time=0);
        call_procedure(a);
        call_procedure(b);
        call_procedure(c);
        wait_for_interrupt(time=25);
        call_procedure(a);
        call_procedure(b);
        call_procedure(d);
        call_procedure(e);
        wait_for_interrupt(time=50);
        call_procedure(a);
        call_procedure(b);
        call_procedure(c);
        wait_for_interrupt(time=75);
        call_procedure(a);
        call_procedure(b);
        call_procedure(d);
        wait_for_interrupt(time=100);
end loop;
```