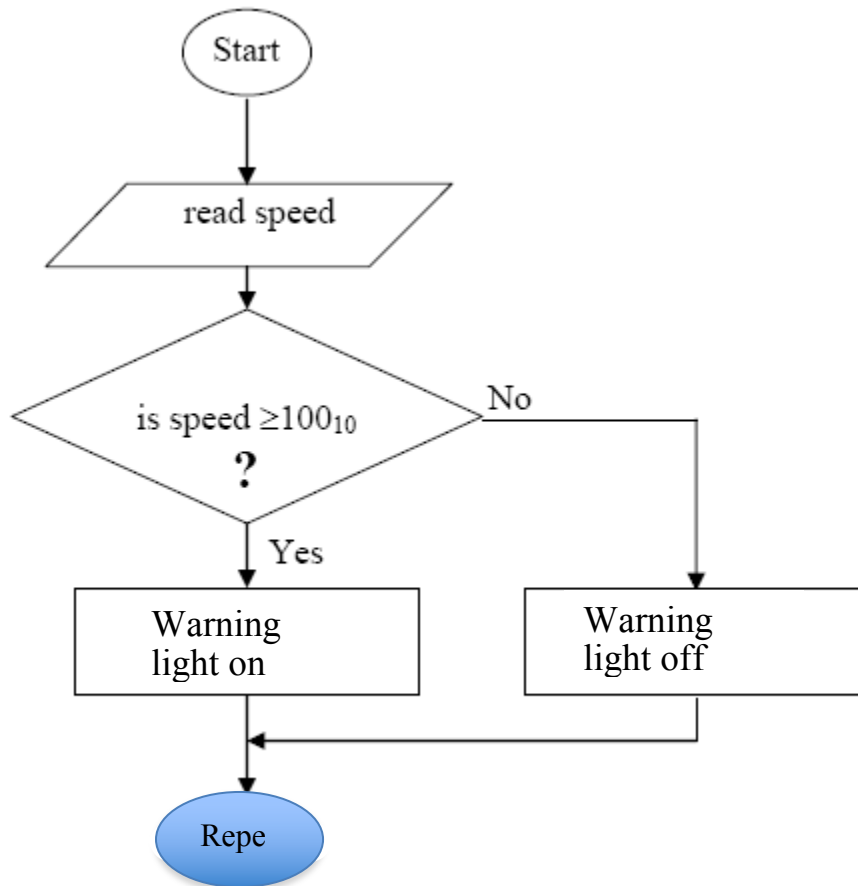Digital and Embedded Systems
Professor Thomas Bräunl

Tutorial 6 – Application Programming in C

1. Data Monitoring

Write a **C subroutine** "checkspeed" for the Nano controller to perform the following function:

Speed is read as an 8-bit **unsigned integer** that needs to be read from port B.

If speed is greater or equal to 100 (decimal) it switches on a warning light; otherwise, the light is turned off. The warning light is controlled by bit 4 on port D. A "1" on bit 4 turns on the light and a 0 turns it off. The other bits of port D are used for other functions.
This program should loop forever.

Write a C program to solve this task.

2. Temperature Control

A Nano microcontroller is used to control the temperature in this room. The microcontroller has been hooked up such that the 8-bit **signed number** stored at address $0400 represents the temperature in this room in degrees Celsius. Also, a switch that controls the heater for this room is connected to Bit 0 of PORT D, and a switch that controls the air conditioner for this room is connected to Bit 4 of PORTD.

Writing a 0 to Bit 0 turns the heater off; writing a 1 to Bit 0 turns the heater on. Writing a 0 to Bit 4 turns the air conditioner off; writing a 1 to Bit 4 turns the air conditioner on.

Write a **C program** on the microcontroller, which will do the following:

- Set up Bits 0 and 4 of PORTD as output bits. The other bits of PORTD should be set up as inputs.
- If the temperature in the room is below 20 degrees, make sure the air conditioner is off and the heater is on.
- If the temperature in the room is between 20 and 24 degrees, make sure both the heater and air conditioner are off.
- If the temperature in the room is above 24 degrees make sure the air conditioner is on and the heater is off.
- Repeat this set of instructions forever.