MECH 6621 Project

presented by

Naeem Yassin

Roy Rizk

Mohammad Dabbous

presented to

Prof. YouminZhang

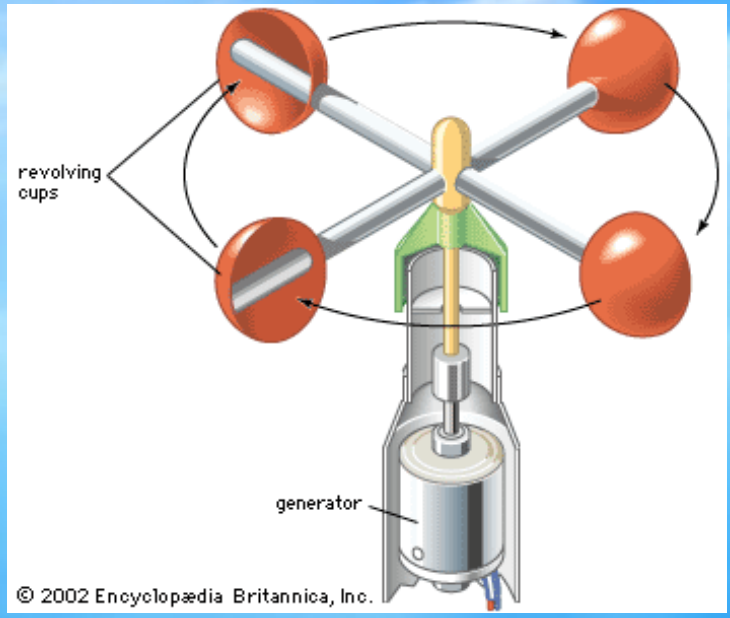
Dept. of Mechanical and Industrial Engineering

Concordia University

Weather Station

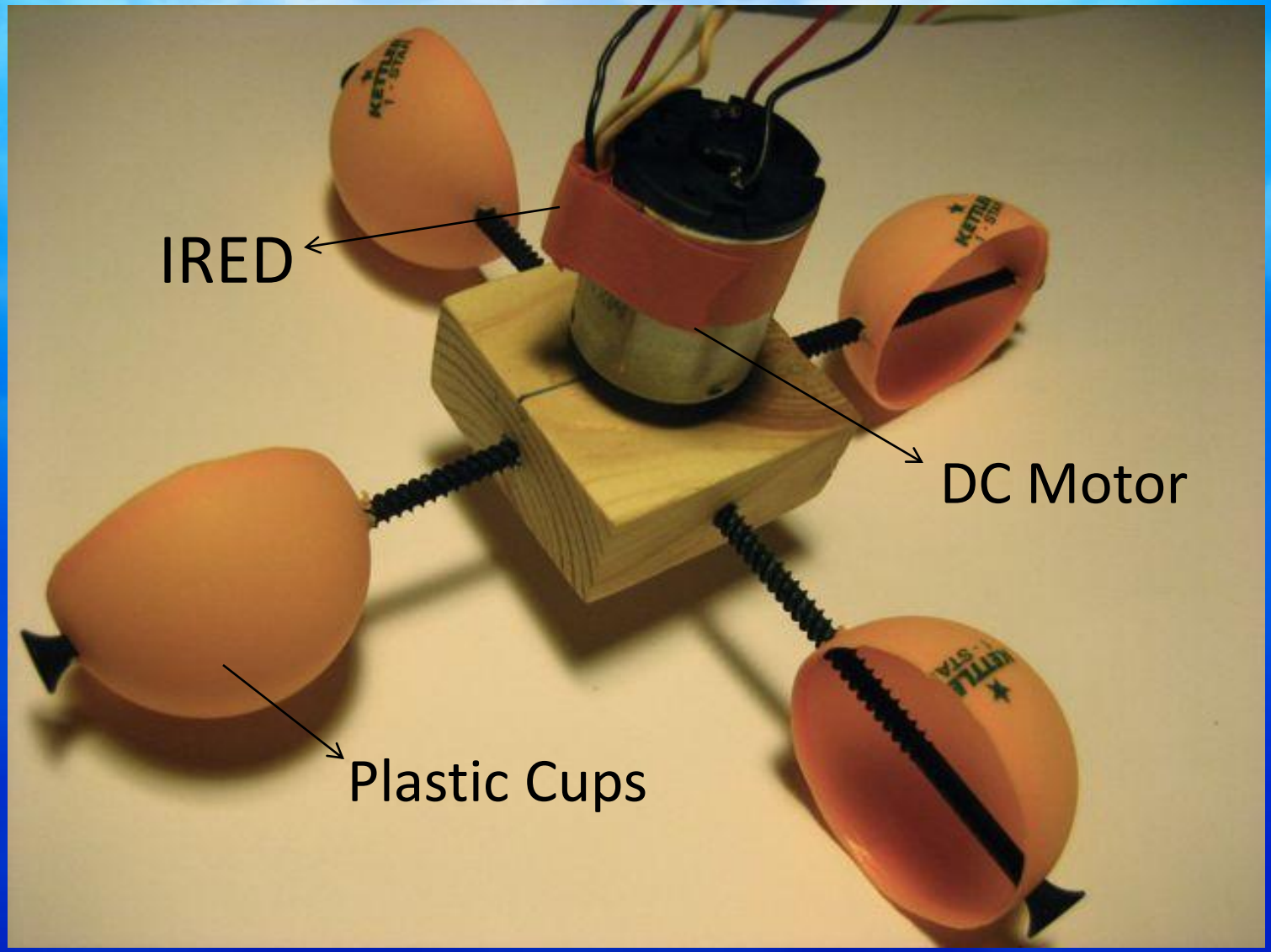
- Anemometer (Wind Speed Sensor)
- Temperature Sensor (LM35D)
- LCD Data Display

Anemometer

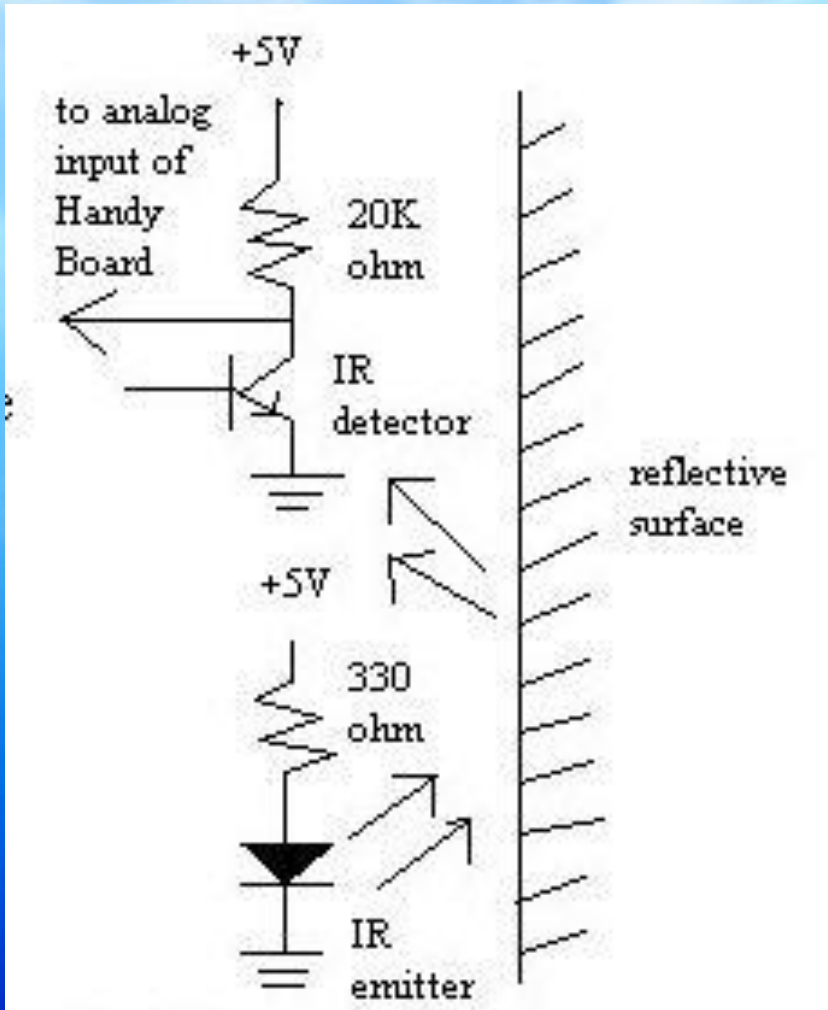


- An instrument with three or four small hollow metal hemispheres that measures wind velocity.
- An electrical device records the revolutions of the cups and calculates the wind velocity.

Anemometer Components

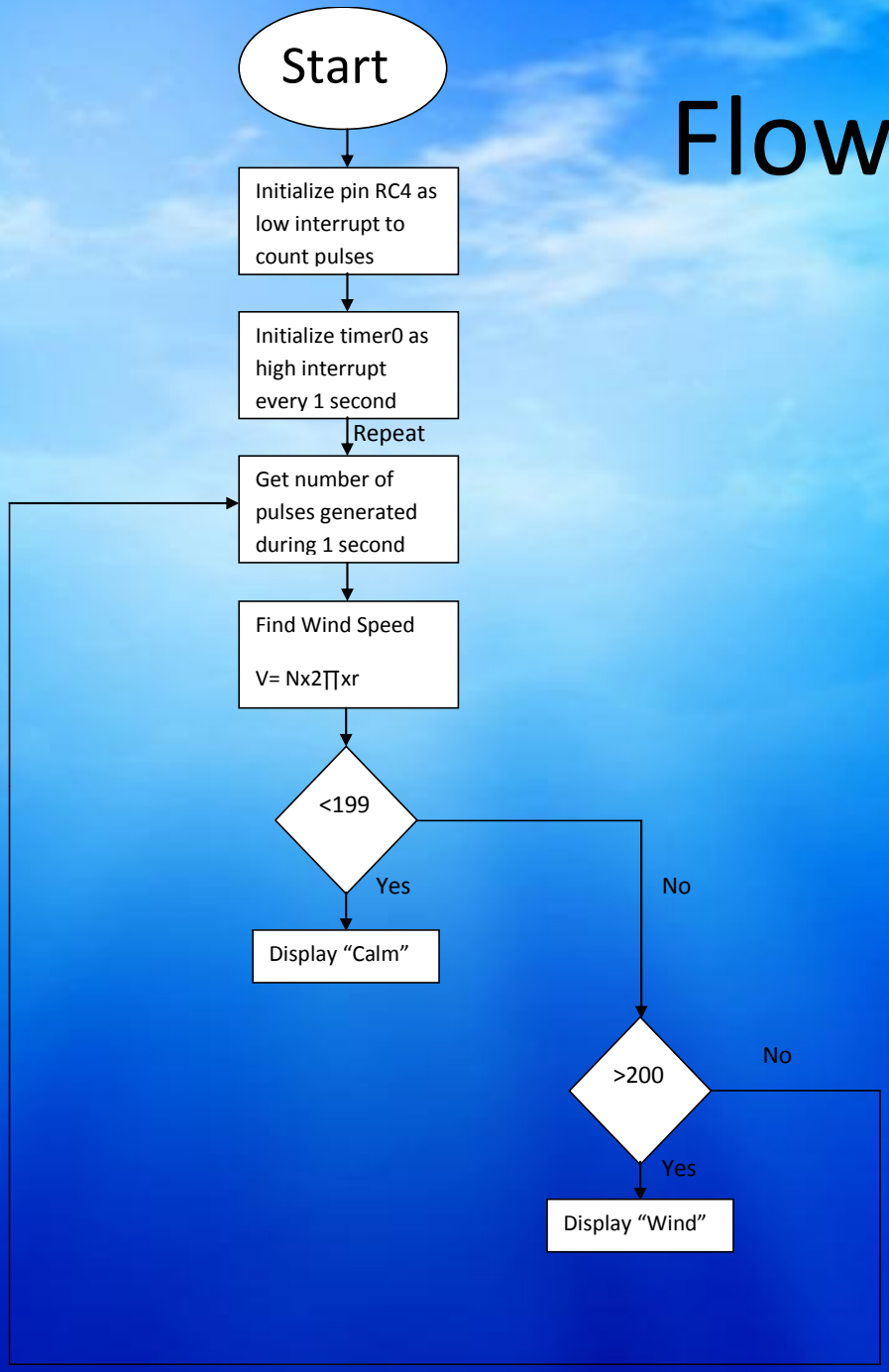


Infra Red Emitter & Detector



Circuit diagram of a infrared reflectance sensor.

Flowchart


Start
Initialize pin RC4 as low interrupt to count pulses
Initialize timer0 as high interrupt every 1 second
Repeat
Get number of pulses generated during 1 second
Find Wind Speed
V= Nx2∏xr
<199
Yes
No
Display “Calm”
>200
No
Yes
Display “Wind”

Low priority interrupts initialization

Register	B7	B6	B5	B4	B3	B2	B1	B0
RCON	IPEN (1)							
INTCON	GIE/GIEH (1)	PEIE/GIEL (1)	TMR0IE (1)			TMR0IF		
INTCON2			INTEDG1 (0)				TMR0IP(1)	
INTCON3		INT1IP (0)			INT1IE (1)		INT1IF (1)	

The name or number 1 placed under each bit means that these bits are set to high (high=1), if 0 or nothing is put under the bit it means that this bit is set to low.

Timer0 initialization

Register	B7	B6	B5	B4	B3	B2	B1	B0
T0CON	TMR0ON (1)	0	0	0	0	T0PS2 (1)	T0PS1(0)	T0PS0(1)

TIMER0 in 16 bits is set to generate a high-priority interrupt every 1 second using 1:64 pre-scale:

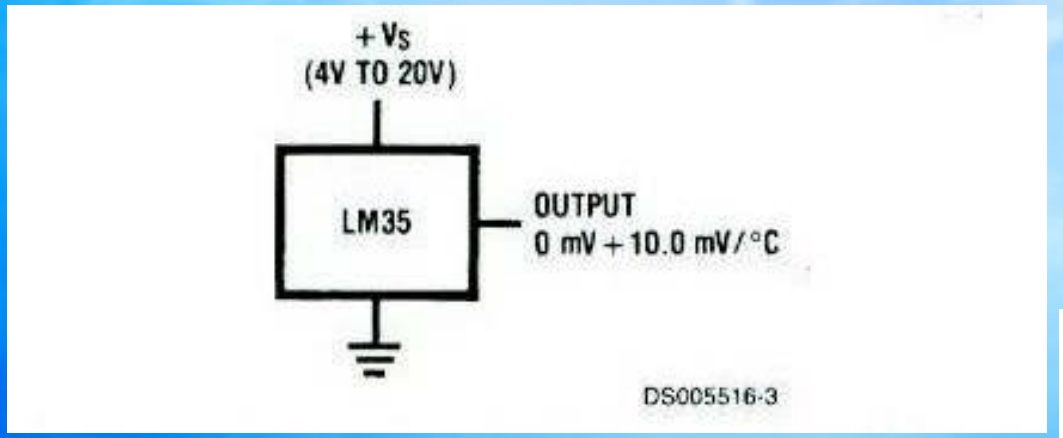
The internal clock period T is T= 1/8 Mhz =125ns
The instruction period = 4T =125ns x 4 =500ns
Number of instruction cycles needed to generate 1 second
N= 1s/500ns =2000000
For pre-scale of 1:64 the count is C= 2000000/64 C=31250
Since the timer counts only up from a loaded number until 0xFFFF, and rolls over to 0x0000, therefore the pre-loaded number should be 65535 -31250 = 34285 → in Hexadecimal 85ED
We preload TMRH0H by 85 TMRH0L ED

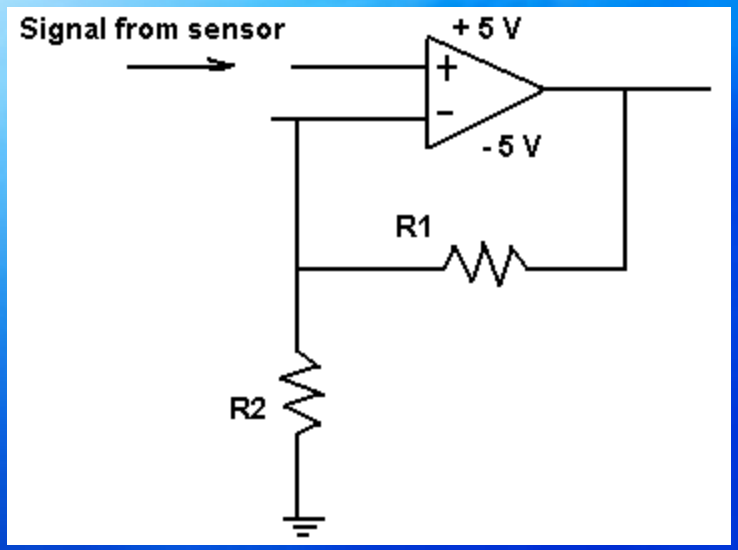
```
movlw   0x85
movwf   TMR0H
movlw   0xED
movwf   TMR0L
```

Anemometer Initialization

```
bsf RCON,IPEN        ;set to enableFF priority

bsf INTCON,GIEH      ;set to enable high priority interrupt
bsf INTCON,GIEL      ;set to enable low priority interrupt
bsf INTCON,TMR0IE    ;enables TMR0 overflow interrupt
bcf INTCON,TMR0IF    ;TMR0 overflow interrupt flag bit


bcf INTCON2,INTEDG1 ;interrupt on falling edge
bsf INTCON2,TMR0IP  ;TMR0 overflow interrupt priority bit set to high priority

bcf INTCON3,INT1IP   ;INT1 interrupt priority bit / clear means low priority
bsf INTCON3,INT1IE   ;external interrupt enable bit
bcf INTCON3,INT1IF   ;clear INT1 flag

movlw b'10000101'    ; TMR0 On / TMR0 setting 64 prescale
movwf T0CON
```

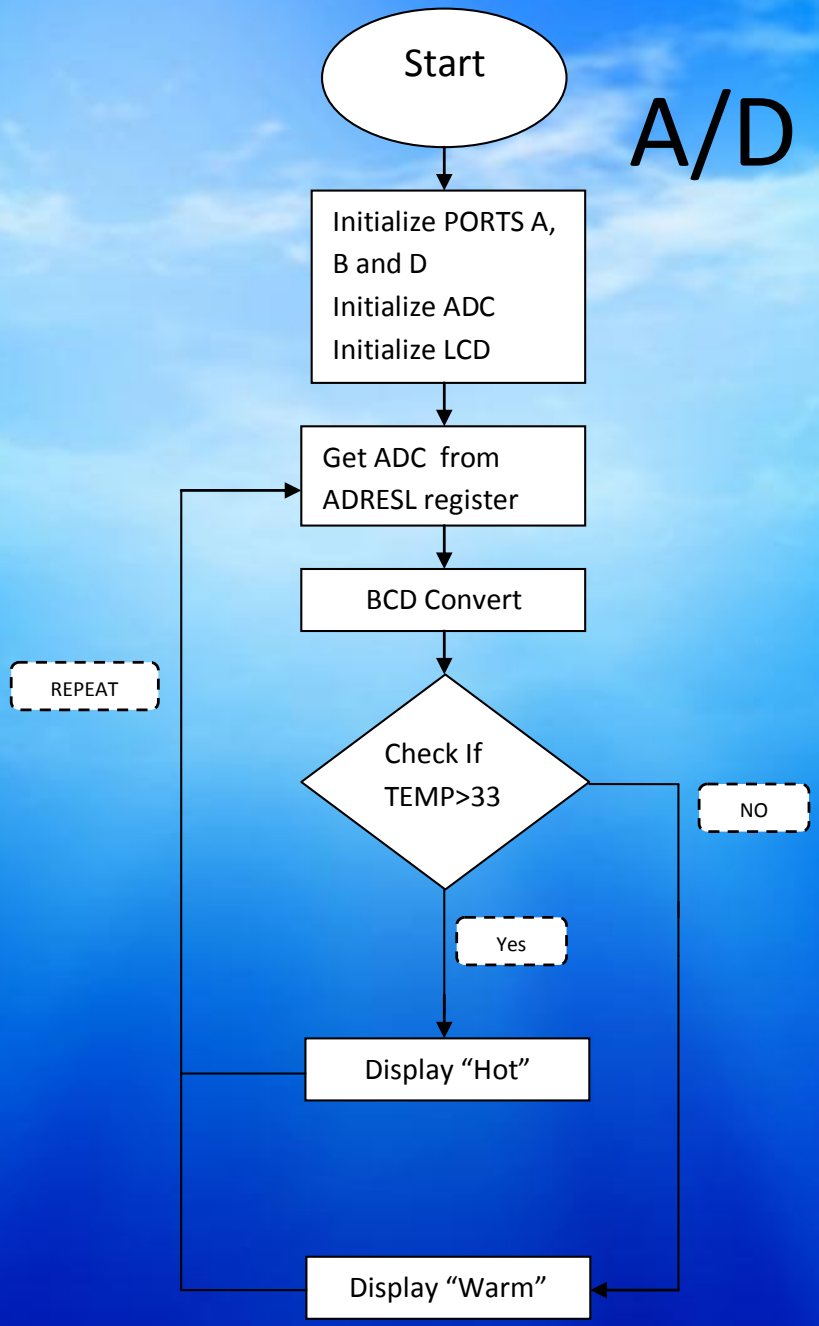
LM35D Temperature Sensor





- Linear + 10.0 mV/C
- 0.5 C accuracy
- Less than 60 uA current drain
- Low self heating, 0.08 C in still air

A/D Flowchart



A/D initialization

Register	B7	B6	B5	B4	B3	B2	B1	B0
ADCON1	VCFG1 (0)	VCFG0 (0)	0	0	0	0	0	0
ANSEL0	0	0	0	ANS4	0	0	0	0
ADCHS	0	0	0	0	0	GASEL1 0	GASEL0 1	0
ADCON0	0	0	ACONV	0	0	0	0	0
ADCON2	ADFM	0	0	ACQT1	0	ADCS2	0	0

The name or number 1 placed under each bit means that these bits are set to high (high=1), if 0 or nothing is put under the bit it means that this bit is set to low.

A/D Initialization

```
;*************************A/D INITIALIZATION*************************************
MOVLW .7
     MOVWF COUNT9
     BCF ADCON1,VCFG1 ; Vref- is AVss
     BCF ADCON1,VCFG0 ; Vref+ is AVdd
     BSF ANSEL0,ANS4 ;Analog input
     BCF ADCHS,GASEL1 ;Choosing AN4
     BSF ADCHS,GASEL0
     BCF ADCON0,ACONV ;Single-shot mode
     BSF ADCON2,ADFM ;Right justification
     MOVLW 0X94
     MOVWF ADCON2 ;4TAD & FOSC/4
     BSF ADCON0,ADON ;A/D enable
     call DELAY_10US
     BSF STATUS,C
```

Video

Thank You