Ministero della Pubblica Istruzione
Dipartimento dell'Istruzione
Direzione Generale per gli Affari Internazionali Uff. V.

Istituto d'Istruzione Superiore "M.BARTOLO"

LICEO Scientifico – LICEO Scientifico Tecnologico – LICEO delle Scienze Umane
ITIS (Meccanica, Meccatronica e Energia- Elettronica ed Elettrotecnica – Informatica e Telecomunicazioni)
ITIS Serale (Meccanica, Meccatronica e Energia- Elettronica ed Elettrotecnica – Informatica e Telecomunicazioni)
Viale A. Moro – 96018 PACHINO (SR) – Tel.e fax 0931/020131 – 0931 020132
Via Fiume – 96018 PACHINO (SR)- Tel. E fax 0931 846359
www.primopachino.it – Email sris01400g@istruzione.it – sris01400g@ec.it – C. F. 83002910897

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Introduzione alla robotica

4° incontro

Relatore Prof. Sebastiano Giannitto

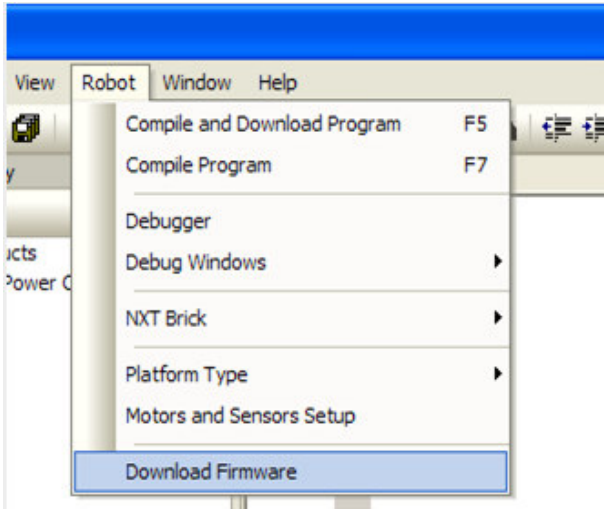
LEGO MINDSTORMS NXT

Introduzione a ROBOT C

Seguire queste indicazioni per imparare a diventare subito operativi con ROBOTC.

1. Download del firmware

Installata o aggiornata la versione di ROBOTC, o se la si utilizza con un robot per la prima volta, sarà necessario scaricare il firmware ROBOTC. Per scaricare il firmware ROBOTC al vostro robot, andare al menu Robot e selezionare il download del firmware.



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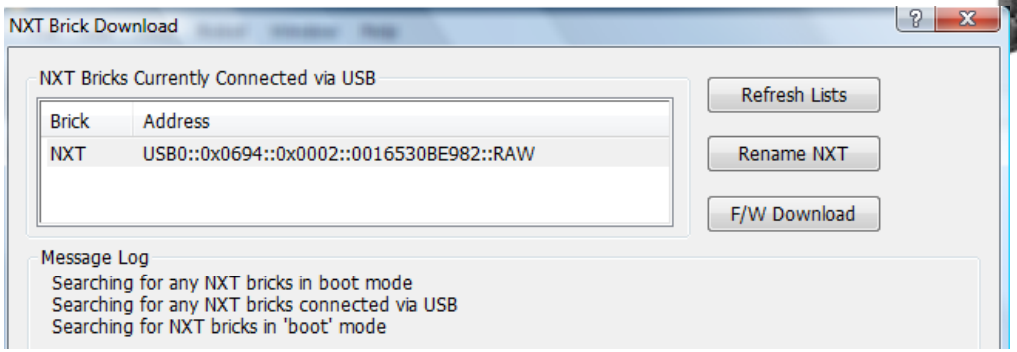
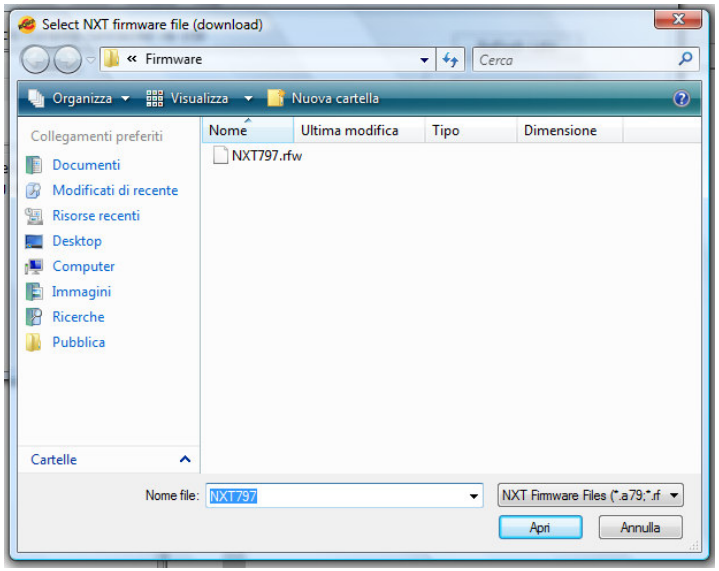
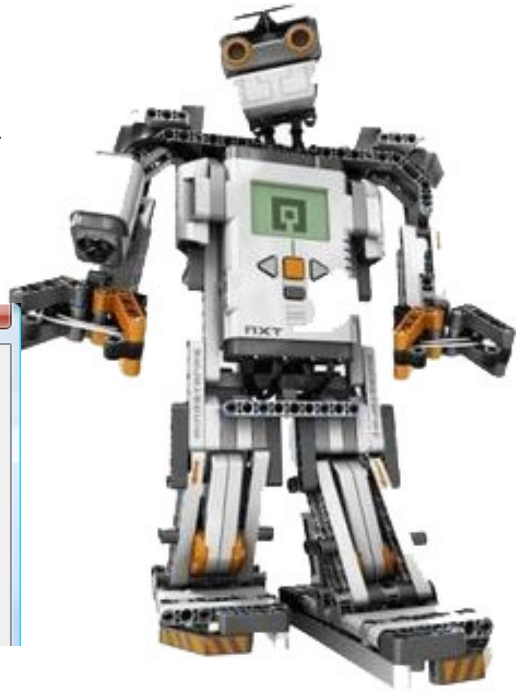
Introduzione a ROBOT C

- Quindi, selezionare la "F / W Download“ per scegliere il firmware da scaricare sul tuo NXT.







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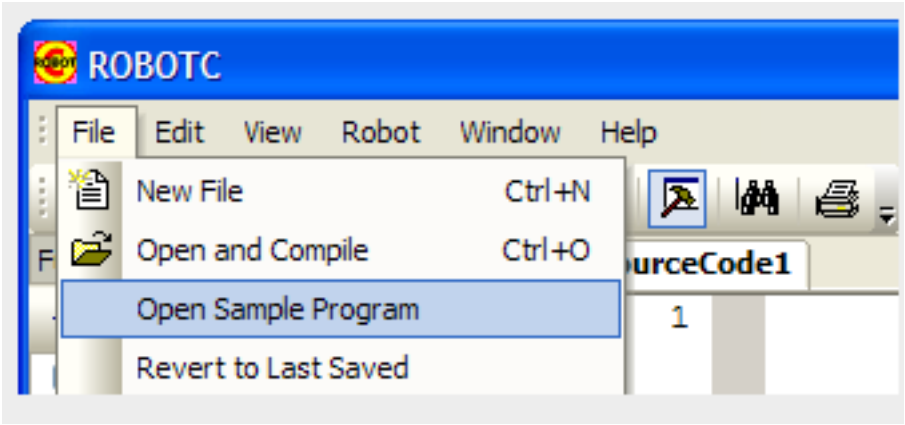
Introduzione a ROBOT C

2° Apertura di un programma di esempio

ROBOTC include oltre 150 programmi di esempio per aiutarvi a iniziare a imparare a programmare. Per aprire un programma di esempio, andare al menu File e selezionare Open Sample Program.



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Introduzione a ROBOT C

- **Per ottenere una maggiore assistenza**

ROBOTC include una Guida o Help. È possibile avviare il sistema di guida, vai alla Guida - Guida ROBOTC, oppure premendo il tasto F1 sulla tastiera.

Links:

- ROBOTC.net
- ROBOTC Forums
- ROBOTC Support
- Teaching ROBOTC for Mindstorms
- ROBOTC Curriculum for TETRIX and LEGO Mindstorms
- 3rd Party Sensor Drivers

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Introduzione a ROBOT C

Scrittura di un programma

selezionare File- New File

Scrivere il seguente programma:

```
task main()
    {
        motor[motorC] = 50;
        motor[motorB] = 50;
        wait1Msec(4000);

        motor[motorC] = -50;
        motor[motorB] = 50;
        wait1Msec(800);

        motor[motorC] = 50;
        motor[motorB] = 50;
        wait1Msec(2000);
    }
```

Descrivere il comportamento dell'NXT

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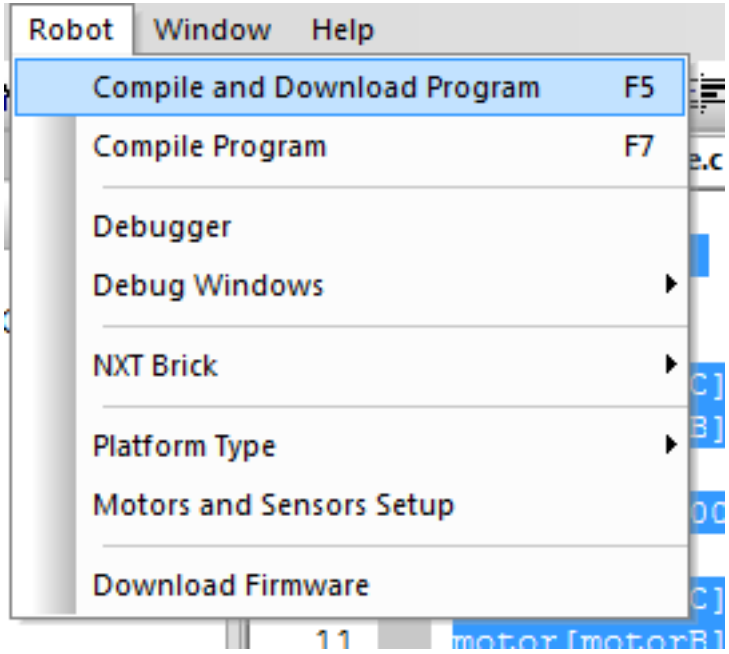
Introduzione a ROBOT C

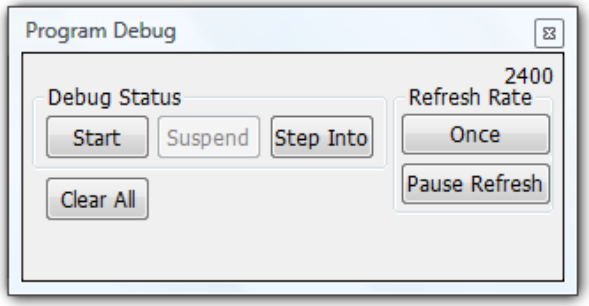
Esecuzione di un programma

1. collegare l'NXT al pc via USB
2. selezionare

   Robot – Compile and Download Program o pigiare F5



3. Nella finestra di Debug, cliccare su Start



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Introduzione a ROBOT C

ESERCIZIO n°2

```
task main()
{
        int i = 0;                      // The variable 'i' is declared as an integer, and initialized to equal zero.
        while(i < 3)                    // While 'i' is less than3:
        {
                motor[motorC] = 75;     // Motor C is run at a 75 power level.
                motor[motorB] = 0;      // Motor B is stopped.
                wait1Msec(750);         // The robot turns for 750 milliseconds before running further code.

                motor[motorC] = -75;    // Motor C is run at a -75 power level.
                motor[motorB] = 0;      // Motor B is stopped.
                wait1Msec(750);         // The robot turns for 750 milliseconds before running further code.

                motor[motorC] = 0;      // Motor C is stopped.
                motor[motorB] = 75;     // Motor B is run at a 75 power level.
                wait1Msec(750);         // The robot turns for 750 milliseconds before running further code.

                motor[motorC] = 0;      // Motor C is stopped.
                motor[motorB] = -75;    // Motor B is run at a -75 power level.
                wait1Msec(750);         // The robot turns for 750 milliseconds before running further code.

                i++;                    // The variable "i" is incremented (increased) by 1.
        }
}
```

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Introduzione a ROBOT C

ESERCIZIO n°3

```
task main()
{
  nSyncedMotors = synchBC;          //motor B is the master, motor C is the slave
  nSyncedTurnRatio = -100;          //motors move in opposite directions of one an
  nMotorEncoder[motorB] = 0;        // Reset the Motor Encoder of Motor B.

  while(nMotorEncoder[motorB] < 760)
                                    // While the Motor Encoder of Motor B has not yet reached 360 counts;
                                    // (motor B turns one full wheel revolution)
  {
  motor[motorB] = 30;               //turn motor B on, which controls motor C at 30% power
  }
  motor[motorB] = 0;                // turn the motors off.

  wait1Msec(3000);
}
```

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Introduzione a ROBOT C

ESERCIZIO n°4

```
/ /the program below uses the nMotorTargetEncoder function
  with synchronized motors
task main()
{
  nSyncedMotors = synchBC;                    //motor B is the master, motor C is the slave
  nSyncedTurnRatio = -100;                    //motors move in opposite directions of one another
  nMotorEncoder[motorB] = 0;                  // clears the value of motorB's encoder
  nMotorEncoderTarget[motorB] = 760;          // sets a target of 360 degrees
  motor[motorB] = 30;                         //turns the motor on at 30% power
  while(nMotorRunState[motorB] != runStateIdle)  //while motorB is not in an idle state
  {
        //continue to power motorB until the motor nMotorEncoderTarget position is reached
  }
  motor[motorB] = 0;                          // turn the motors off.
  wait1Msec(3000);
}
```

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Introduzione a ROBOT C

ESERCIZIO n°5

Il robot procede in avanti fino a quando non rileva un ostacolo,

a questo punto si ferma:

```
#pragma config(Sensor, S4,    sonarSensor,       sensorSONAR)
                                  // #pragma serve a configurare il sensore ad ultrasuoni alla porta di ingresso S4
task main()
{
 int distance_in_cm = 20;          // Create variable 'distance_in_cm' and initialize it to 20(cm).

  while(SensorValue[sonarSensor] > distance_in_cm)
                                    // While the Sonar Sensor readings are less than the specified,
                                       'distance_in_cm':
  {
    motor[motorB] = 35;           // Motor B is run at a 35 power level
    motor[motorC] = 35;           // Motor C is run at a 35 power level
  }
  motor[motorB] = 0;              // Motor B is stopped at a 0 power level
  motor[motorC] = 0;              // Motor C is stopped at a 0 power level
}
```

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Introduzione a ROBOT C

ESERCIZIO n°6

Il robot si muove in avanti sino a quandol'oggetto non raggiunge la distanza di 35cm per invertire la marcia se l'oggetto viene più vicino rispetto alla distanza specificata

```
#pragma config(Sensor, S4,    sonarSensor,        sensorSONAR)
task main()
{
  int speed = 0;                    // Will hold the speed of the motors.
  int sonarValue = 0;               // Will hold the values read in by the Sonar Sensor.
  int distance = 35;                // Specified distance to be at 35 centimeters.
  while(true)                       // (infinite loop, also represented by 'while(1)' or, if you are feeling devious,
                                    //  'for(;;)' which is read as 'for ever').
  {
    sonarValue = SensorValue(sonarSensor);          // Store Sonar Sensor values in 'sonarValue' variable.
    nxtDisplayCenteredTextLine(0, "Sonar Reading"); /* Display Sonar Sensor values */
    nxtDisplayCenteredBigTextLine(2, "%d", sonarValue); /* to LCD screen using %d.    */
    wait1Msec(100);                 // Only update the screen every 100 milliseconds.
    speed = (SensorValue(sonarSensor) - distance);  // Variable 'speed' is set to the reading of the Sonar
                                                    // Sensor - some distance in centimeters (here we used
                                                    // 35cm).
```

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Introduzione a ROBOT C

ESERCIZIO n°6

```
if(speed > 100)
  {
      speed = 100;        // Check to see if calculated speed is greater than 100, if so make it 100.
  }
  nxtDisplayCenteredTextLine(5, "%d", speed);        /* Display variable 'speed' to the LCD.      */
  nxtDisplayCenteredTextLine(7, "Motor Speed");      /* (which is the current speed of the motors) */
  motor[motorC] = speed;                             // Set Motor C is run at a power level equal to 'speed'.
  motor[motorB] = speed;                             // Set motor B is run at a power level equal to 'speed'.
 }
}
```

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Introduzione a ROBOT C

ESERCIZIO n°7

```
#pragma config(Sensor, S1,    soundSensor,        sensorSoundDB)
                                //This program runs your robot forward until a loud noise is made.
task main()
{
        wait1Msec(1000);                    // Wait for 1 second to ignore initial readings of the Sound Sensor.
        while(SensorValue(soundSensor) < 70)       // While the Sound Sensor is less than 70 (quiet):
        {
                motor[motorC] = 75;                 // Motor C is run at a 75 power level.
                motor[motorB] = 75;                 // Motor B is run at a 75 power level.
        }
        motor[motorC] = 0;                          /* Otherwise, when loud noises are heard, Motor C */
        motor[motorB] = 0;                          /* and motor B stop.                              */
}
```

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Introduzione a ROBOT C

ESERCIZIO n°8

```
#pragma config(Sensor, S2,     soundSensor,        sensorSoundDB)
/* La velocità di movimento del robot dipende dal volume di rumore rilevato dal sensore
Più forte è il suono, più velocemente il robot andrà..   */
task main()
{
  wait1Msec(1000);       // A one-second wait is required to cleanly initialize the Sound Sensor.

  while(true)                 // Infinite loop
  {
    motor[motorB] = SensorValue[soundSensor];    /* Motors B and C are run at a power level equal */
    motor[motorC] = SensorValue[soundSensor];    /* to the value read in by the Sound Sensor.     */
  }
}
```

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Introduzione a ROBOT C

ESERCIZIO n°9

```
#pragma config(Sensor, S1,    touchSensor,       sensorTouch)
/*  This program allows your taskbot to move forward indefinately while monitoring a Touch Sensor.
    If the Touch Sensor is bumped, the robot will reverse and stop.                                  */

task main()
{
  while(SensorValue(touchSensor) == 0)          // While the Touch Sensor is inactive (hasn't been pressed):
  {
    motor[motorB] = 100;                        /* Run motors B and C forward */
    motor[motorC] = 100;                        /* with a power level of 100.*/
  }
                                                // Otherwise (the touch sensor has been activated [pressed] ):
  motor[motorB] = -75;                          /* Run motors B and C backwards */
  motor[motorC] = -75;                          /* with a power level of -75.   */

  wait1Msec(1000);                              // Wait 1000 milliseconds (1 second) before moving to further code.
}
```

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Introduzione a ROBOT C

ESERCIZIO n°10 1/3

```
#pragma config(Sensor, S1,    touchRight,    sensorTouch)
#pragma config(Sensor, S2,    touchLeft,     sensorTouch)
/* Questo programma utilizza due sensori di contatto.
   Se  Touch Sensor di destra è urtato, il robot girera' sinistra, e poi continuera' a spostarsi
 in avanti. Allo stesso modo, se il Touch Sensor di sinistra  è colpito, il robot  girera' a destra, e poi
  continuera' in avanti. */
task main()
{
  int randTime;          // Declare variable 'randTime' to hold a random amount of time later.
   wait1Msec(500);     // Wait 500 milliseconds before running any further code.
   while(true)           // Infinite loop (also represented by 'while(1)' and 'for(;;)' which is read as 'for ever').
  {
     motor[motorC] = 75;                /* Motors A and B are run */
     motor[motorB] = 75;                /* at a power level of 75 */
```

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Introduzione a ROBOT C

ESERCIZIO n°10 2/3

```
if(SensorValue(touchRight) == 1)      // If the Right Touch Sensor is bumped (equal to 1):
  {
    motor[motorC] = -75;                /* Motors A and B are run  */
    motor[motorB] = -75;                /* at a power level of -75 */
    wait1Msec(750);                    /* for 750 milliseconds.   */
     motor[motorC] = 75;                 // Motor C is run forward at a power level of 75.
    motor[motorB] = -75;                // Motor B is run backward at a power level of -75.
    randTime = random(2000);              // 'randTime' is set to a random integer between 0 and 2000.
    wait1Msec(randTime);                //Wait 'randTime' amount of milliseconds.
  }
```

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Introduzione a ROBOT C

ESERCIZIO n°10 3/3

```
if(SensorValue(touchLeft) == 1)      // If the Left Touch Sensor is bumped (equal to 1):
  {
    motor[motorC] = -75;              /* Motors A and B are run  */
    motor[motorB] = -75;              /* at a power level of -75 */
    wait1Msec(750);                  /* for 750 milliseconds.  */
    motor[motorC] = -75;              // Motor C is run backward at a power level of 75.
    motor[motorB] = 75;               // Motor B is run forward at a power level of 75.
    randTime = random(2000);             // 'randTime' is set to a random integer bteween 0 and 2000.
    wait1Msec(randTime);              // Wait 'randTime' amount of milliseconds.
  }
 }
}
```