ARM® ARM926EJ-S

32-bit Microprocessor

NuMaker NuEZCam Samples

For additional information or questions, please contact: Nuvoton Technology Corporation.

www.nuvoton.com

Table of Contents

1 INTRODUCTION

In the beginning we define the NuEZCam solution is that NuEZCam board connects NuVCOM board. In fact NuVCOM board is NuWicam debug board. In this document, we use NuVCOM board instead of NuWicam debug board because NuVCOM does USB functions including USB VCOM.

Within the solution of AVI encoder with Arduino, user could run UART protocol command to communicate between NuEdu UNO board and NuEZCam solution. About the UART protocol command, please refer to the document “UART protocol for NuEZCam.pdf” for more details. AVI encoder could be executed on NuEZCam solution, the Arduino sample code NuMaker_NuEZCam_Arduino_UNO.ino could be executed on the NuEdu UNO board to control the AVI encoder of NuEZCam solution by using UART protocol command. The operation of UART protocol command uses the button and the specified flash time of LED for NuEdu UNO board. NuEdu UNO board is compatible with Arduino UNO board. Therefore we could use Arduino sample and library to do it, in order to save the development time of Arduino sample.

In this document, we will describe how to construct the samples of NuEZCam solution with Arduino. These samples includes NuMaker_NuEZCam_Arduino_UNO.ino for Arduino IDE, and Non-OS Keil BSP for NuEZCam solution. The sample NuMaker_NuEZCam_Arduino_UNO.ino has the functions of one LED controlling and one button. The sample can be executed on NuEdu UNO (or Arduino UNO) board.

1.1 NuEZCam Solution with Arduino

NuEZCam solution with Arduino uses GPIO 2 to be the button, GPIO 13 to be the LED for NuEdu UNO board. The following Figure 1–1 is the front view and back view of NuEZCam board. The pin TX of NuEdu UNO board connects the pin RX of NuEZCam board. The pin RX of NuEdu UNO board connects the pin TX of NuEZCam board. The pin 5V of NuEdu-UNO board connects the pin 5V of NuEZCam board. The pin GND of NuEdu UNO board connects the pin GND of NuEZCam board. The NuEdu UNO board is shown as Figure 1–2.

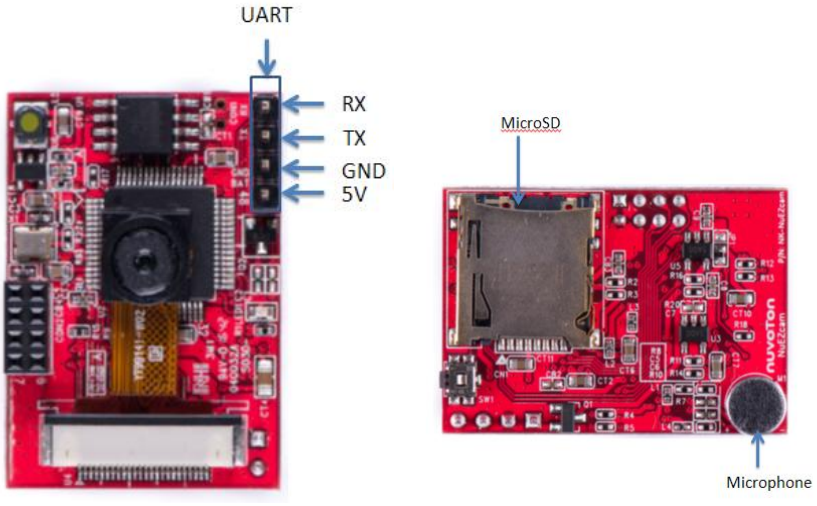


Figure 1–1 NuEZCam board.

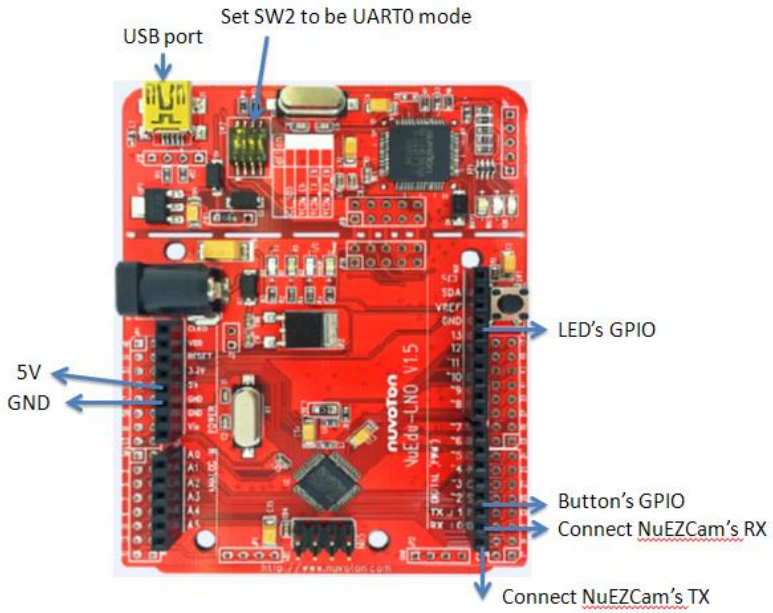


Figure 1–2 NuEdu UNO board.

After connecting between NuEdu UNO board and NuEZCam board, please make sure to set SW2 to be UART0 mode as the following Figure 1–3.

Switch Pin Number	Function Name	UART0 Mode	VCOM Mode
1	ICE_VCC	On	On
2	VCOM_En	Off	On
3	VCOM_TX	Off	On
4	VCOM_RX	Off	On

Figure 1–3 UART0 mode of NuEdu UNO board.

The NuEZCam solution includes NuEZCam board and NuVCOM board, the both boards connect together as shown in Figure 1–4.

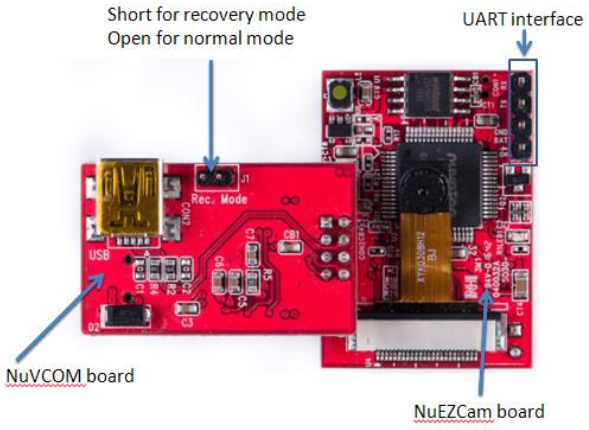


Figure 1–4 View of NuEZCam solution.

The purposes of NuVCOM board do USB applications and set booting modes including normal mode and recovery mode. USB VCOM also shows UART log for NuEZCam solution.

Then RX/TX of NuEdu UNO could communicate with NuEZCam board by using UART0 mode, 115200 baud rate. User could press down the button of NuEdu UNO board, set the specified flash time of LED and release the button, then the specified flash time of LED is the input.

When the solution runs, user presses down the button and LED flashes. LED flashes one time and release the button, it means to run the option 1 AVI encoder, and later LED flashes 3 times to acknowledge. What times does LED flash and release the button ? it means input the specified flash times, 2 times run the option 2 USB UVC+UAC, 3 times run the option 3 USB MSC, 4 times stop AVI encoder, 5 times capture one image during AVI encoder. And later LED flashes 3 times to acknowledage. If LED flashs many times, the input fails. User must restart NuEZCam solution and NuEdu UNO board to check.

1.2 NuEZCam Solution with ARM Mbed OS

NuEZCam solution with ARM mbed OS uses SW1 to be the button, LED1 to be the LED for NUC472 board. The pin TX (D1) of NUC472 board connects the pin RX of NuEZCam board. The pin RX (D0) of NUC472 board connects the pin TX of NuEZCam board. The pin 5V of NUC472 board connects the pin 5V of NuEZCam board. The pin GND of NUC472 board connects the pin GND of NuEZCam board. The connection between NUC472 board and NuEZCam solution is shown as Figure 1–5.

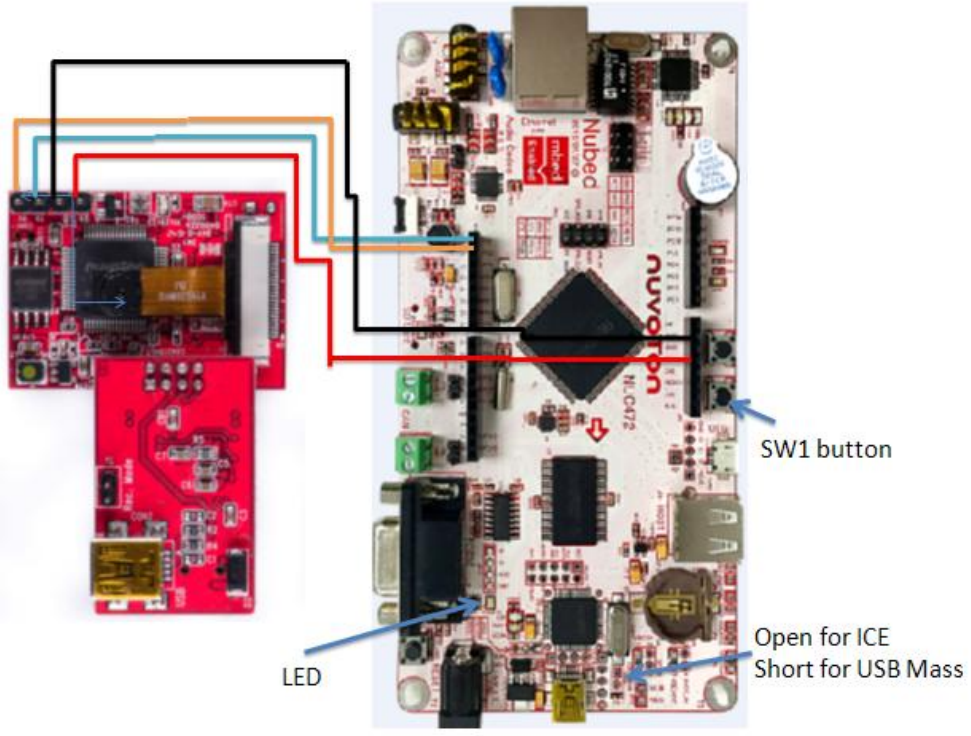


Figure 1–5 The connection between NuEZCam solution and NUC472 board.

The purposes of NuVCOM board do USB applications and set booting modes including normal mode and recovery mode. USB VCOM also shows UART log for NuEZCam solution.

Then RX/TX of NUC472 board could communicate with NuEZCam board by using UART mode, 115200 baud rate. User could press down the SW1 button of NUC472 board, set the specified flash time of LED and release the button, then the specified flash time of LED is the input.

When the solution runs, user presses down the SW1 button and LED flashes. LED flashes one time and release the button, it means to run the option 1 AVI encoder, and later LED flashes 3 times to acknowledge. What times does LED flash and release the button ? it means input the specified flash times, 2 times run the option 2 USB UVC+UAC, 3 times run the option 3 USB MSC, 4 times stop AVI encoder, 5 times capture one image during AVI encoder. And later LED flashes 3 times to acknowledage. If LED flashs many times, the input fails. User must restart NuEZCam solution and NUC472 board to check.

User could visit the website https://developer.mbed.org/platforms/Nuvoton-NUC472/ to check the information of NUC472 board.

2 ARDUINO SOLUTION

2.1 Board schematics

Figure 2-1 is the NuEZCam solution with NuEdu UNO board. The four pins RX/TX/GND/5V of NuEZCam solution connects the four pins TX/RX/GND/5V of NuEdu UNO board, it is shown in the following Figure 2–2.

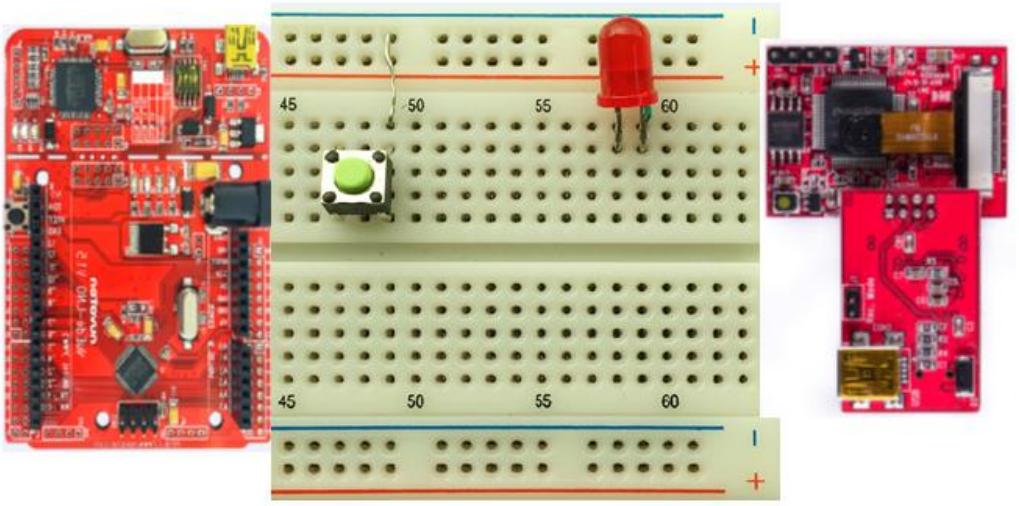


Figure 2–1 NuEZCam solution with NuEdu UNO board

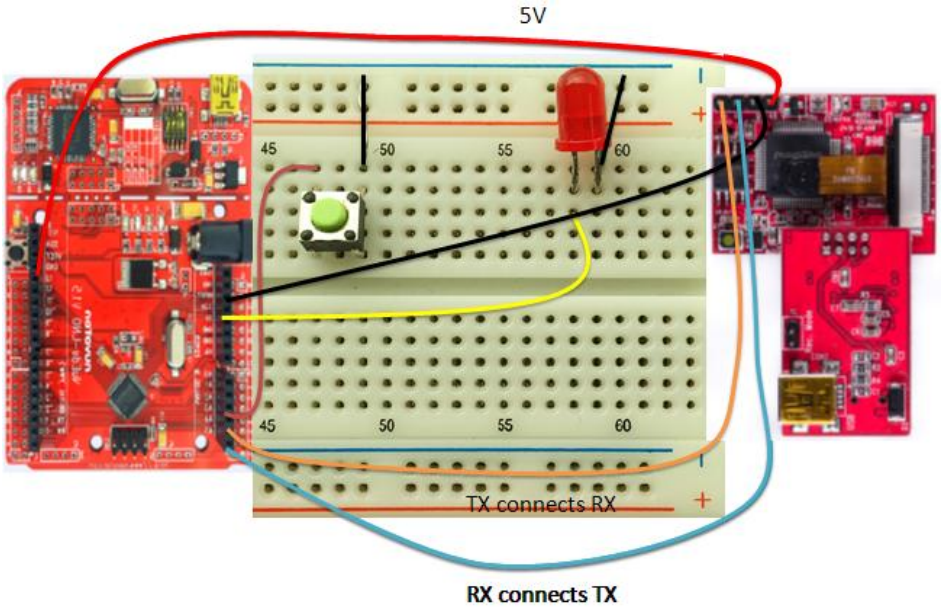


Figure 2–2 NuEZCam solution with NuEdu UNO board after connecting the components

2.2 Requirement

2.2.1 Hardware

- NuVCOM board and NuEZCam board with firmware x 1
- Nn-Edu UNO board x 1 or Arduino UNO board x 1
  - **If your board is Nu_Edu UNO, please remember to switch 2, 3 and 4 of SW2 to 'OFF' on the board.**
- Red LED x 1.
- One button

2.2.2 Software

- Arduino IDE v1.6.9 (or later)
  - You can refer to the page to install arduino IDE for NuEdu UNO board. https://www.arduino.cc/en/Main/Software
- NuMaker_NuEZCam_Arduino_UNO sample code for Arduino UNO/NuEdu UNO board.
  - Please download source on github server.
  - Path: https://github.com/OpenNuvoton/NuMaker_NuEZCam_Samples
- Non-OS_Keil BSP
  - Please download Non-OS BSP on github server.
    Path: https://github.com/OpenNuvoton/NuMaker_NuEZCam_Samples
- Windows tool AutoWriter
  - Please download AutoWriter tool on github server.
    Path: https://github.com/OpenNuvoton/NuMaker_NuEZCam_Samples

2.3 Purchasing information

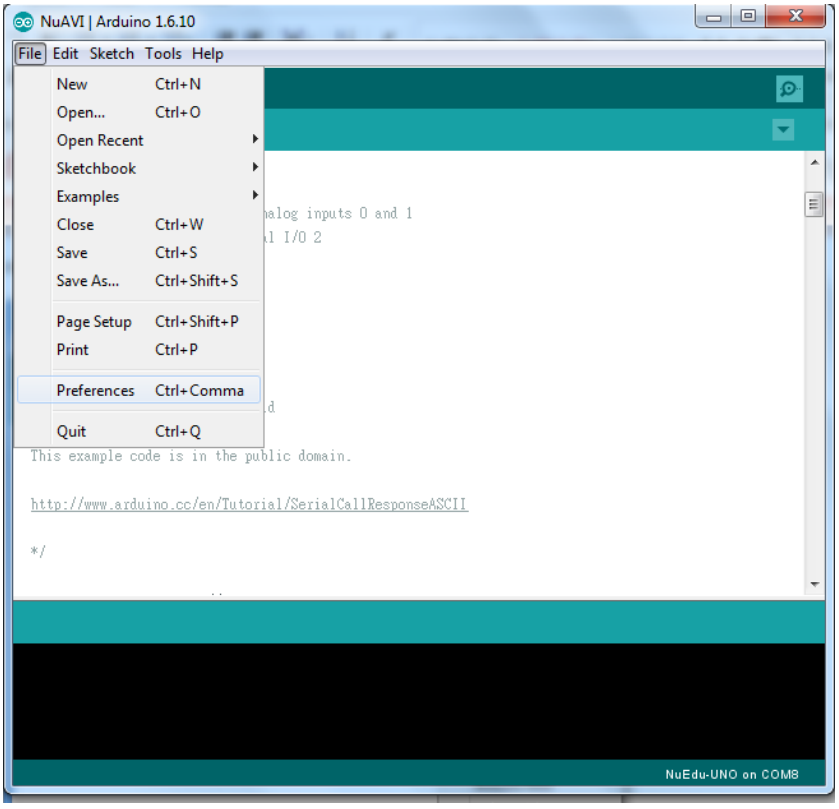
- **NuEdu UNO board**
  URL: https://world.tmall.com/item/523268526584.htm?spm=a312a.7700824.w4011-6765047385.25.2qjfiz&id=523268526584&rn=93873a1038dd4952f86ee4c2766ccae0&abbucket=10

2.4 Arduino IDE installation

Step 1: Download Arduino 1.6.10 IDE from https://www.arduino.cc/en/Main/Software

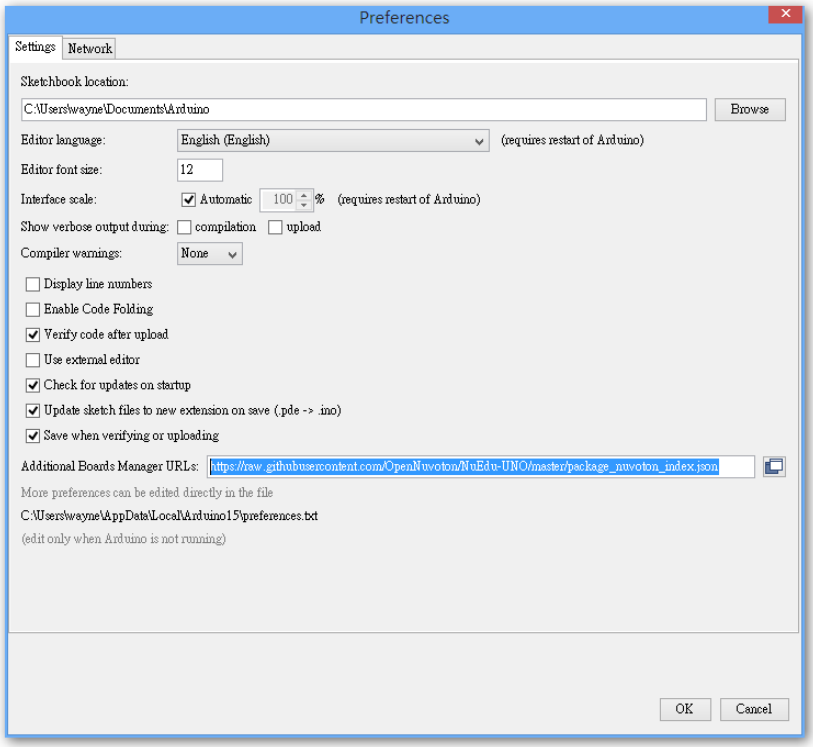
Step 2: Extract arduino-1.6.10-windows.zip to c:\arduino-1.6.10.

Step 3: Double-click arduino.exe, and then go to File->Preferences.

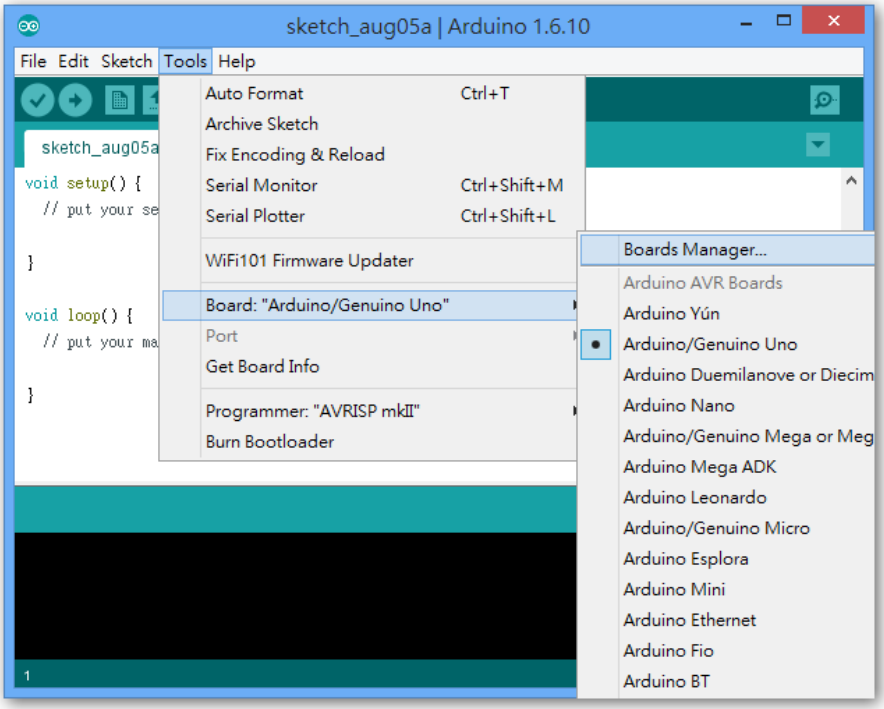


Step 4: Paste following URL to 'Additional Boards Manager URLs' input field:

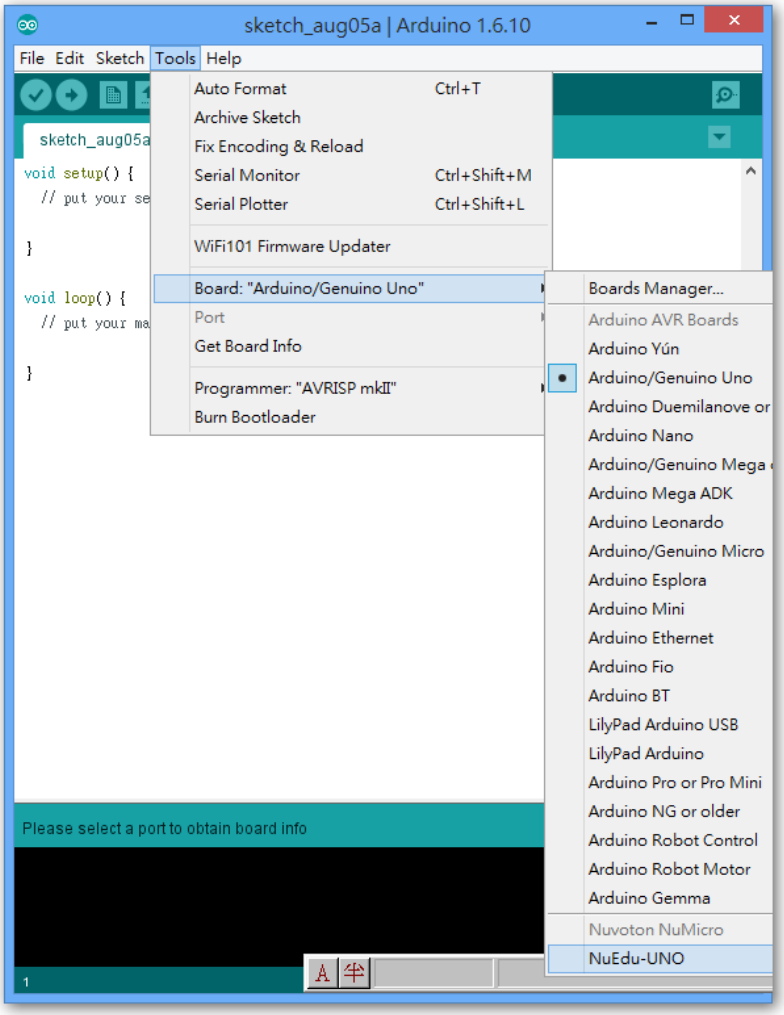
https://raw.githubusercontent.com/OpenNuvoton/NuEdu-UNO/master/package_nuvoton_index.json



Step 5: Under Tools->Board->Boards Manger, search NuEdu-UNO by Nuvoton, click Install



Step 6: You can select NuEdu-UNO in Arduino IDE now.



If you could not found the menu item NuEdu-UNO, please check your network.

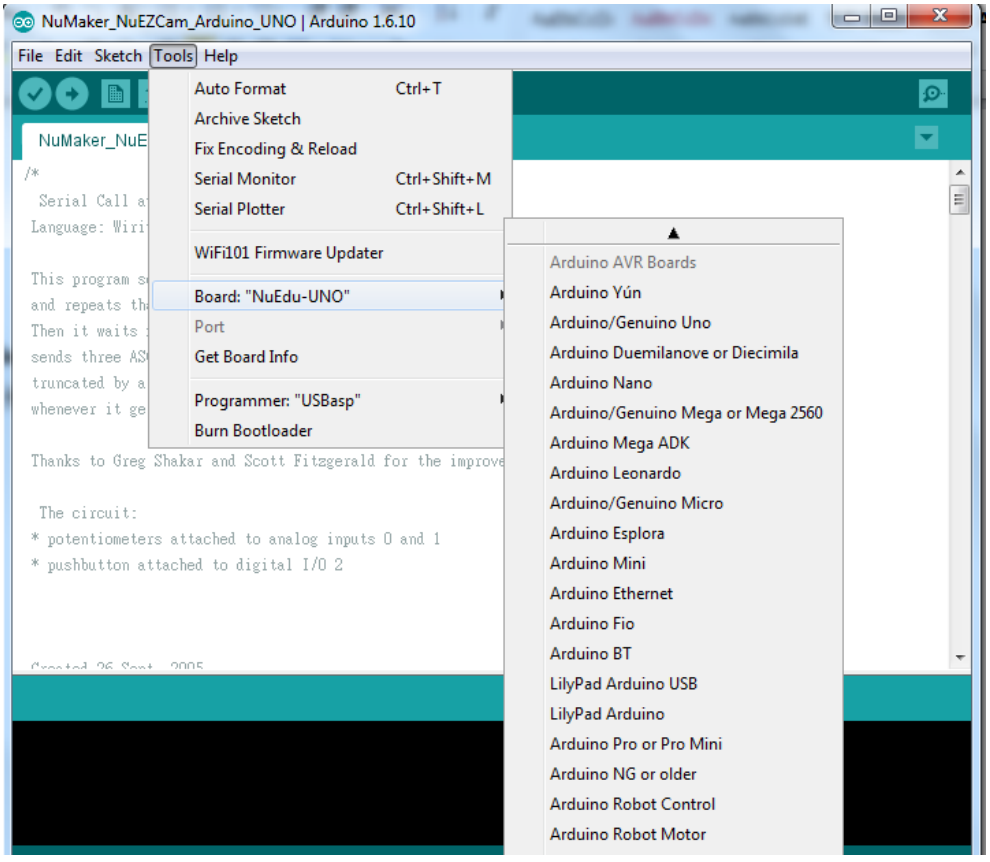
2.5 Sample code building

Please follow the below steps to build executable binary.

Step 1: Load NuMaker_NuEZCam_Arduino_UNO sample code for Arduino UNO board.

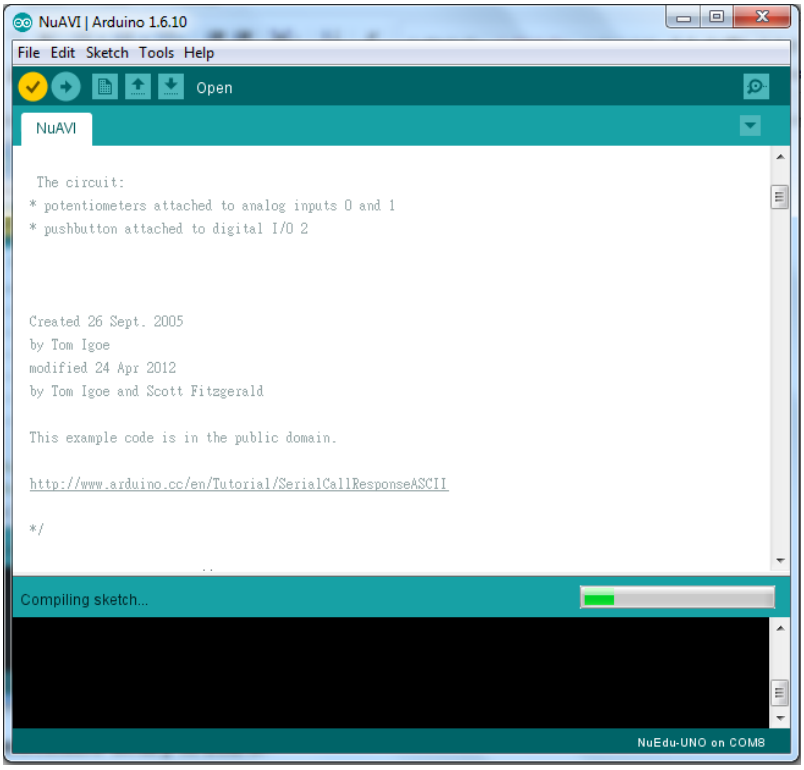
Step 3: Select configuration for Geduino UNO board.

<Tools> → <Board: "NuEdu UNO"> → Select NuEdu UNO.



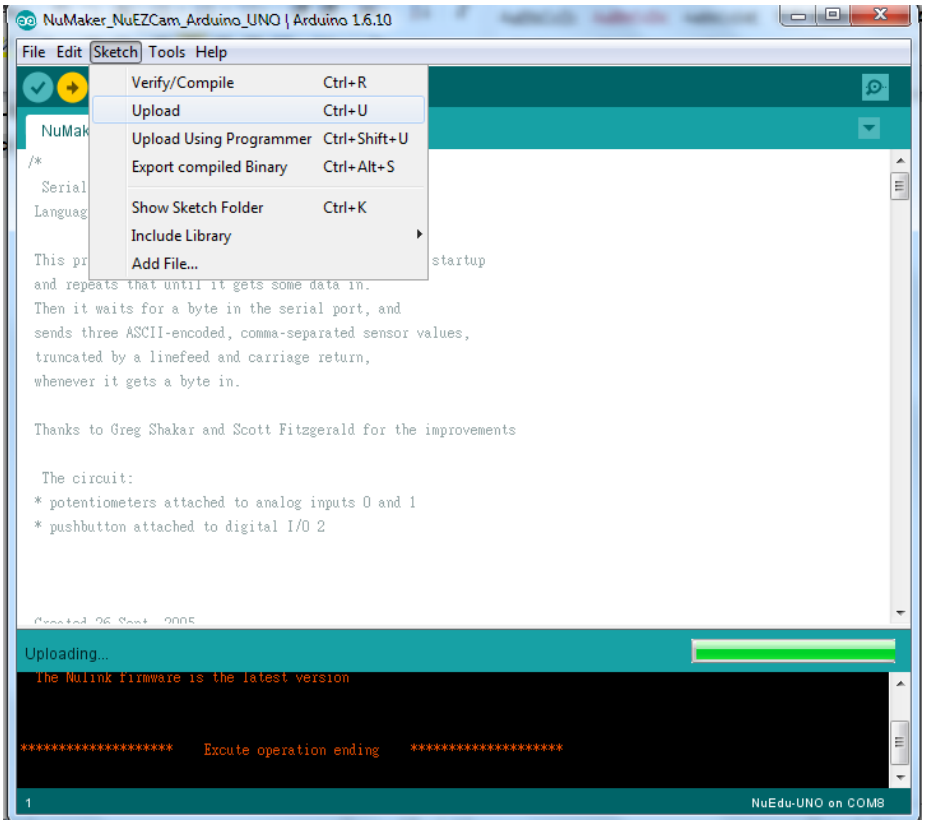
Step 4: Build sample code.

<Sketch> → <Verify/Compile>



Step 5: Upload executable binary to board.

<Sketch> → <Upload>


NuMaker_NuEZCam_Arduino_UNO | Arduino 1.6.10
File Edit Sketch Tools Help
Verify/Compile Ctrl+R
Upload Ctrl+U
Upload Using Programmer Ctrl+Shift+U
Export compiled Binary Ctrl+Alt+S
Show Sketch Folder Ctrl+K
Include Library
Add File...
and repeats that until it gets some data in.
Then it waits for a byte in the serial port, and
sends three ASCII-encoded, comma-separated sensor values,
truncated by a linefeed and carriage return,
whenever it gets a byte in.
Thanks to Greg Shakar and Scott Fitzgerald for the improvements
The circuit:
* potentiometers attached to analog inputs 0 and 1
* pushbutton attached to digital I/O 2
Uploading...
The Nu1nk firmware is the latest version
****************** Excute operation ending ******************
1
NuEdu-UNO on COM8

3 ARM MBED OS SOLUTION

3.1 Board schematics

Figure 1–5 is the NuEZCam solution with NUC472 board. The four pins RX/TX/GND/5V of NuEZCam solution connects the four pins TX/RX/GND/5V of NUC472 UNO board,

3.2 Requirement

3.2.1 Hardware

- NuVCOM board and NuEZCam board with firmware x 1
- NUC472 board x 1

3.2.2 Software

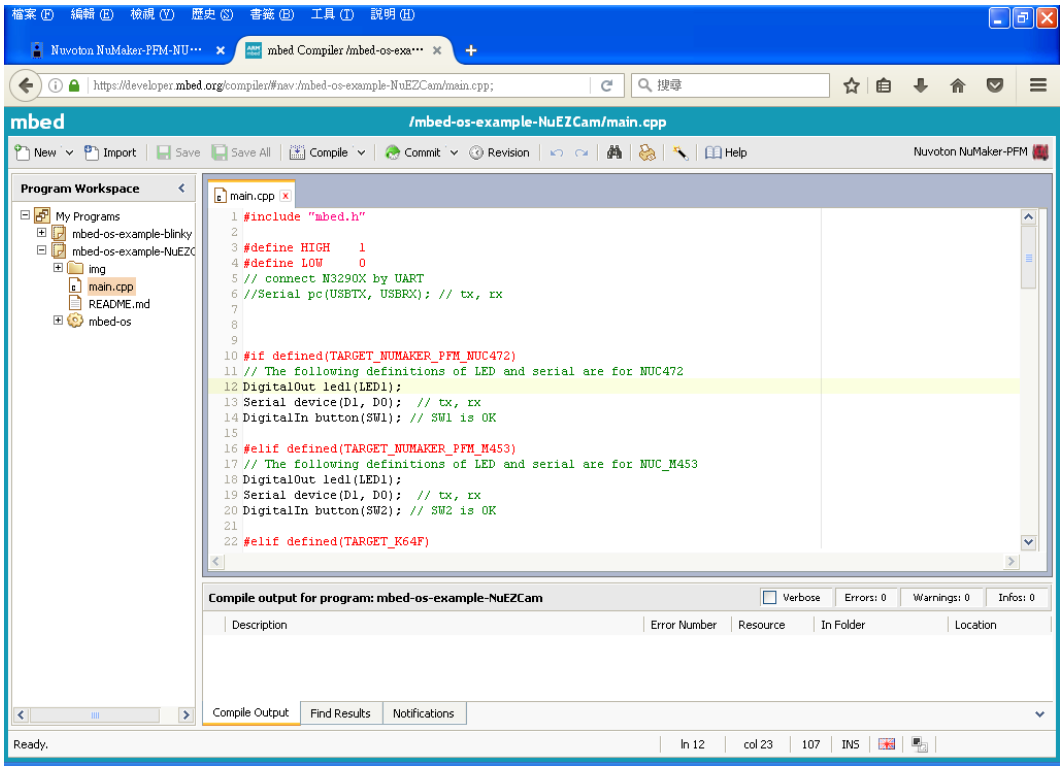
- ARM mbed OS IDE
  - You can build the keil project on line and copy the built binary file into NUC472 board to run. Go to the website https://developer.mbed.org/ to visit ARM mbed OS delveloper site
  - The sample code is located at the path https://developer.mbed.org/users/shliu1/code/mbed-os-example-NuEZCam/
- Non-OS_Keil BSP
  - Please download Non-OS BSP on github server.
    Path: https://github.com/OpenNuvoton/NuMaker_NuEZCam_Samples
- Windows tool AutoWriter
  - Please download AutoWriter tool on github server.
    Path: https://github.com/OpenNuvoton/NuMaker_NuEZCam_Samples
- Windows driver for NUC472 board
  - Please install Windows driver “Nu-Link_USB_Driver 1.2.exe” from the subfolder utility.
    Path: https://github.com/OpenNuvoton/NuMaker_NuEZCam_Samples

3.3 The Processing of ARM mbed OS

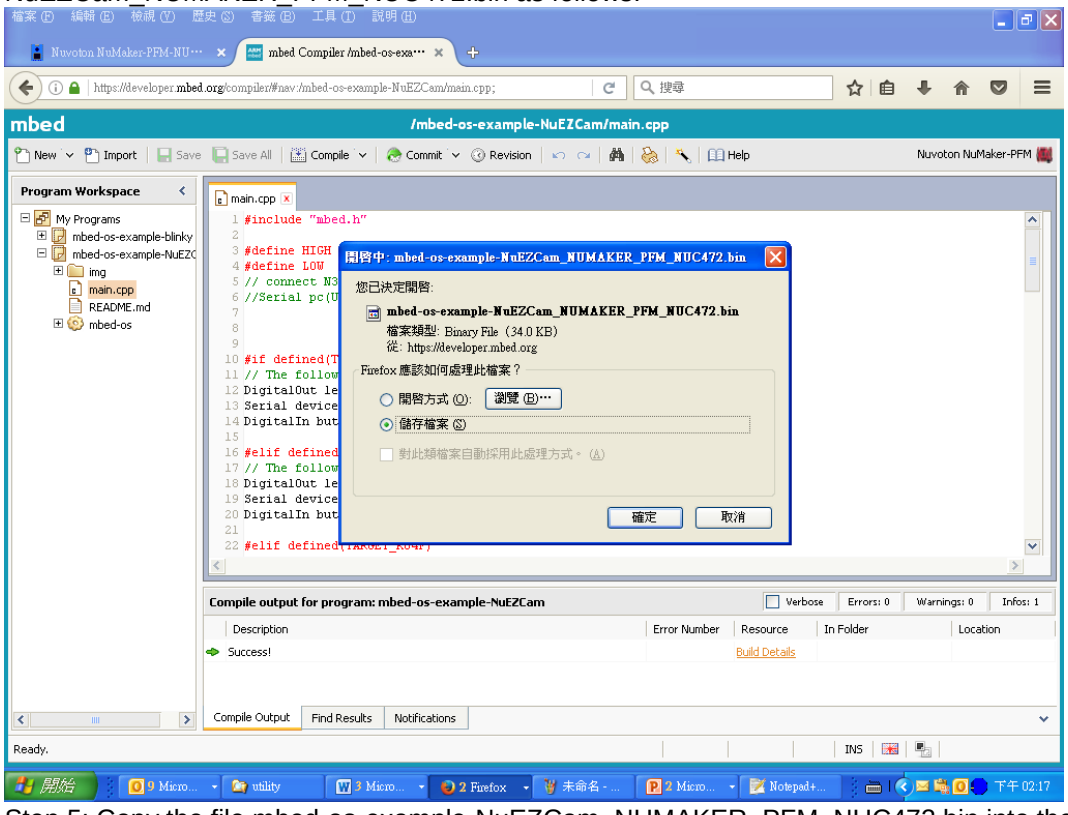
Step 1: User must install Windows driver for NUC472 board by using the file “Nu-Link_USB_Driver 1.2.exe”, and then plug USB cable in between NUC472 board and Windows.

Step 2: Please go to the path https://developer.mbed.org/compiler to work ARM mbed OS IDE on line, go to the path https://developer.mbed.org/platforms/Nuvoton-NUC472/ to obtain the project mbed-os-example-blinky for the platform of Nuvoton NuMaker_PFM_NUC472. Rename the project into mbed-os-example-NuEZCam.

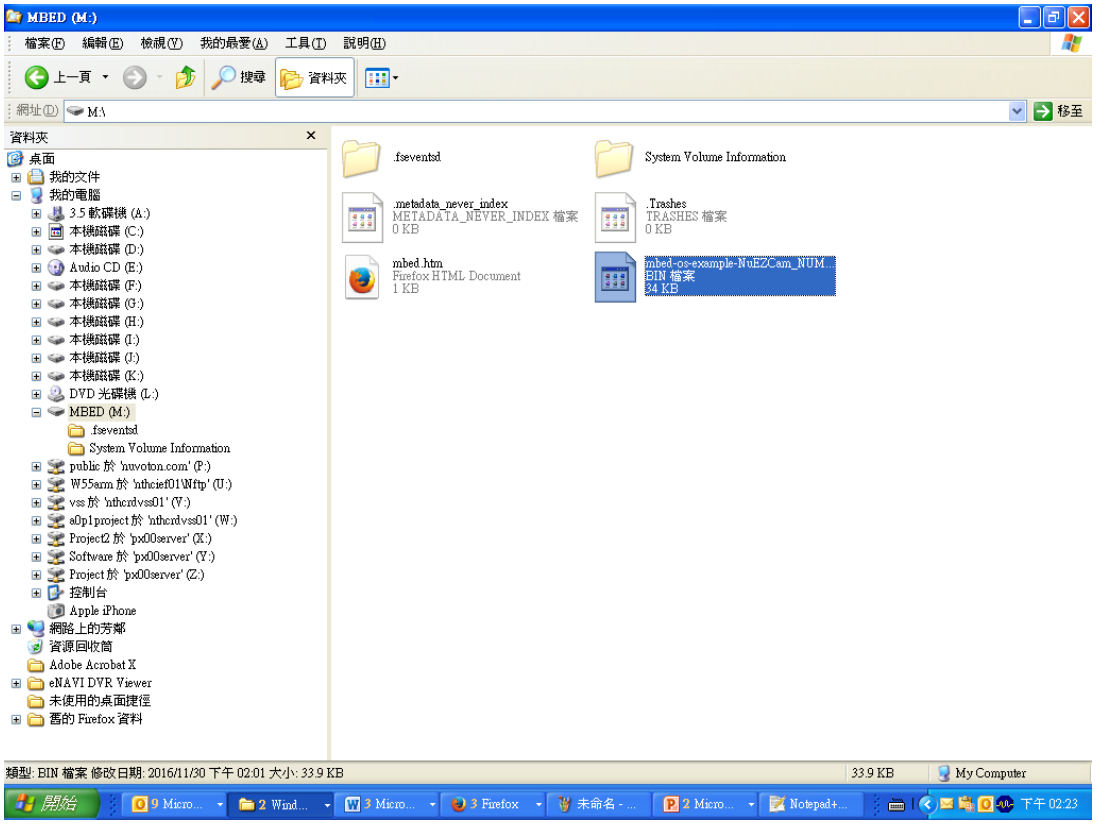
Step 3: Go to the path https://developer.mbed.org/users/shliu1/code/mbed-os-example-NuEZCam/ to obtain the sample code main.cpp and replace the file main.cpp within the project mbed-os-example-NuEZCam as follows.



Step 4: Click down the menu Compiler to build the project, It will success and export one binary file mbed-os-example-NuEZCam_NUMAKER_PFM_NUC472.bin, Save the file mbed-os-example-NuEZCam_NUMAKER_PFM_NUC472.bin as follows.



Step 5: Copy the file mbed-os-example-NuEZCam_NUMAKER_PFM_NUC472.bin into the USB disk MBED as follows.



Step 6: Press the reset button to restart NUC472 board.

4 Q&A

Q: How do test NuEdu UNO board alone by the UART log of Windows ?

A: Please go to the path https://github.com/OpenNuvoton/NuMaker_NuEZCam_Samples , to execute the file ”Nu-Link_USB_Driver 1.2.exe” within the subfolder utility, in order to install the Windows driver of Nuvoton Virtual Com port. SW2 sets VCOM mode for the jumpers VCOM_En, VCOM_TX and VCOM_RX are on. Then the Uart log of Windows could set the commands to NuEdu UNO board. NuEdu UNO has two mode, VCOM mode and UART0 mode. Within VCOM mode, NuEdu UNO board as slave, and could connect the UART log of Windows. For UART0 mode, NuEdu UNO board as master could connect NuEZCam board

Q: Could the other Arduino board do the NuEZCam solution?
A: Currently Arduino UNO board has the UART function, the function could work the UART log of Windows. If the other Arduino board connects the NuEZCam board for four pins RX/TX/GND/5V, it could do the NuEZCam solution.

Q: Could the other boards for ARM mbed OS do the NuEZCam solution?
A: Currently NUC472, M453, NXP K64F and STM32F01 boards could work the NuEZCam solution..
-

5 REVISION HISTORY

Date	Revision	Description
2017.02.09	1.03	1. Support keypad instead of keyboard
2016.12.05	1.02	1. Support NuEZCam solution
2016.09.13	1.01	1. Initially issued

Important Notice

Nuvoton Products are neither intended nor warranted for usage in systems or equipment, any malfunction or failure of which may cause loss of human life, bodily injury or severe property damage. Such applications are deemed, "Insecure Usage".

Insecure usage includes, but is not limited to: equipment for surgical implementation, atomic energy control instruments, airplane or spaceship instruments, the control or operation of dynamic, brake or safety systems designed for vehicular use, traffic signal instruments, all types of safety devices, and other applications intended to support or sustain life.

All Insecure Usage shall be made at customer's risk, and in the event that third parties lay claims to Nuvoton as a result of customer's Insecure Usage, customer shall indemnify the damages and liabilities thus incurred by Nuvoton.