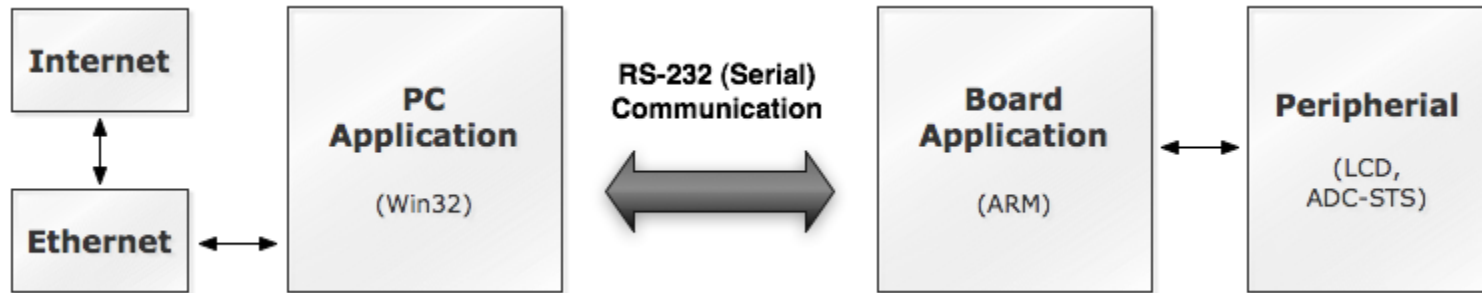


CS211 FINAL PROJECT DEMO Presentation

– PASSION –

20051070 CSE Seunghoon Park /
20061297 LIFE Seongkyu Han

Project Introduction

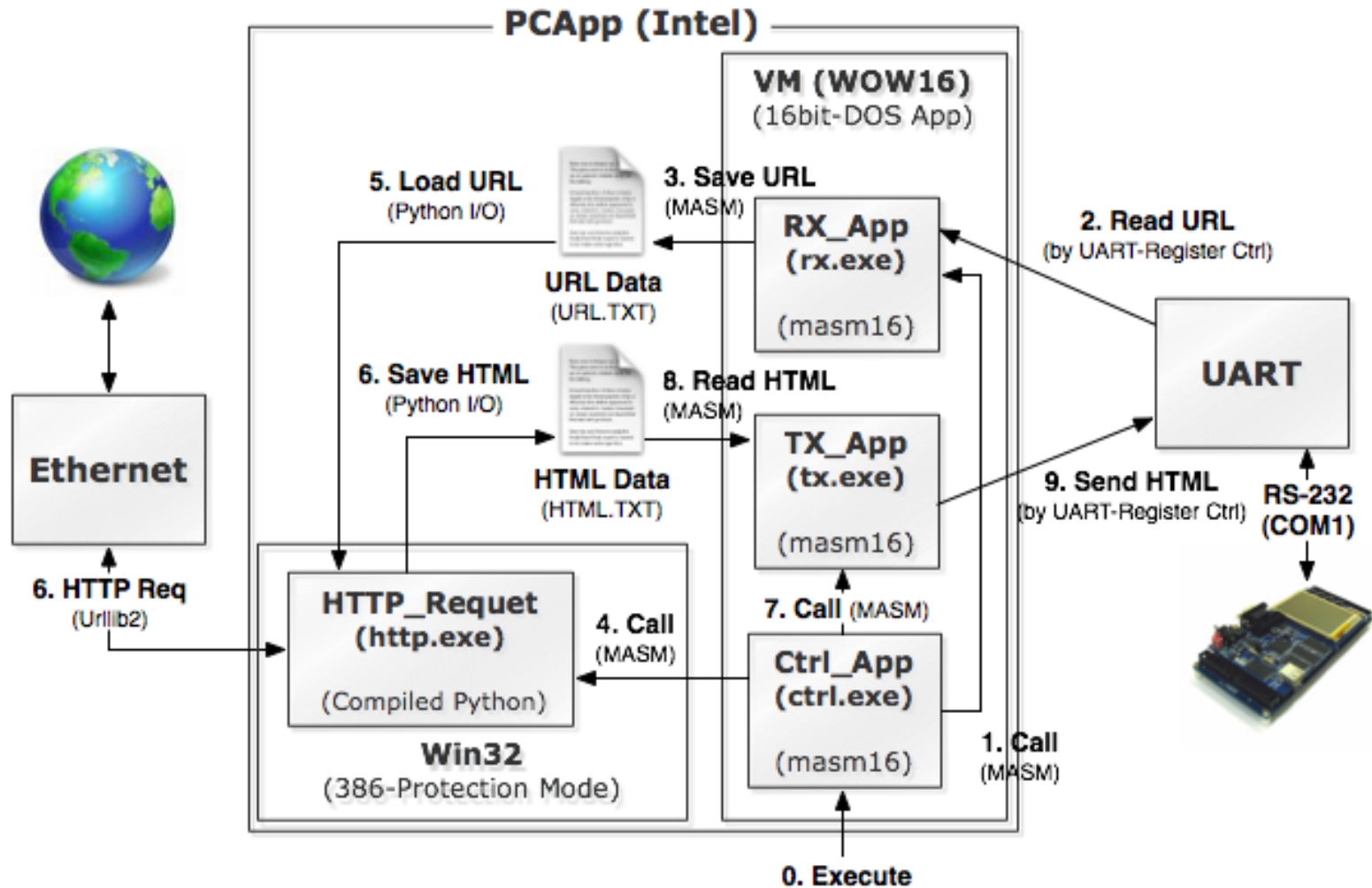


- Development Environment
 - ▣ PC : Intel C2D 2.0GHz / 2G RAM / WinXP
 - ▣ Board : S3C2410x (ARM920T) / SMDK2410 (Board)
 - ▣ ADS 1.2, VS.NET 2005, Python 2.5.1, BitFontCreator
 - ▣ Serial Communication (USB-RS232 Converter Cable)

IA32-Based Application (PC)

- Communicate with Internet (HTTP Request)
 - ▣ Low-Level Ethernet Control (C – winsock2)
 - ▣ High-Level Ethernet Control (Python – Urllib2)
- Communicate with Board (Serial RS-232)
 - ▣ Low-Level UART Control (16bit MASM – Rx/Tx)
 - ▣ High-Level UART Control (C – Windows API)

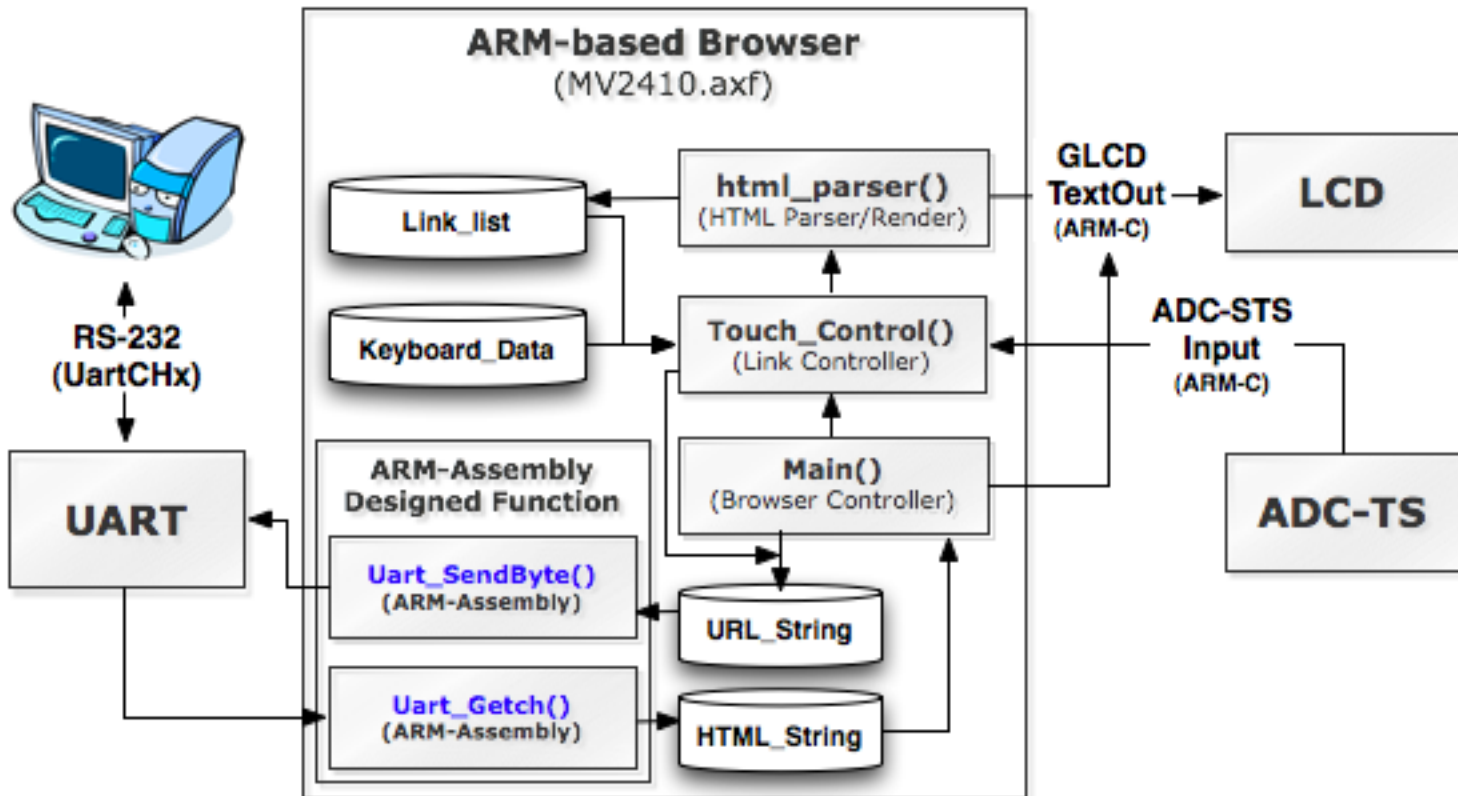
Detail Diagram (PC)



ARM-Based Application (Board)

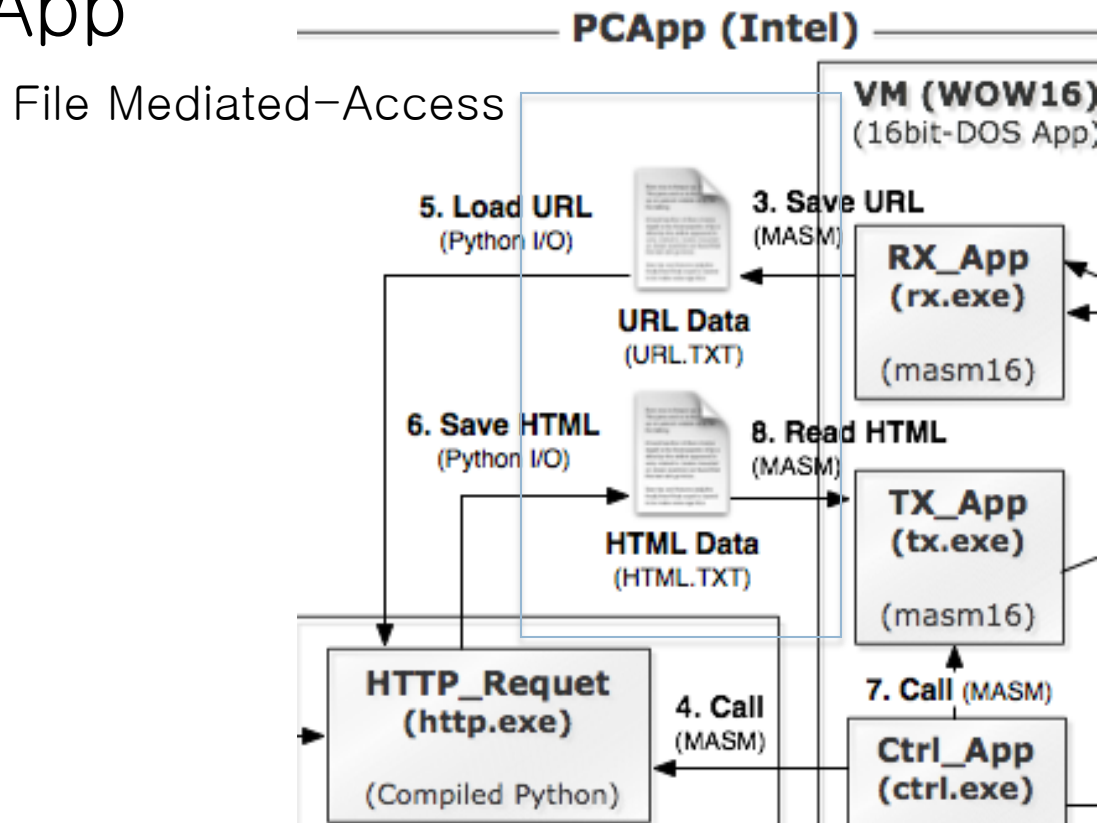
- Communicate with PC (Serial RS-232)
 - ▣ Low-Level UART Register Control (ARMasm)
 - ▣ High-Level UART Command Control (ARM-C)
- Communicate with Peripheral Device in S3C2410
 - ▣ Low-Level Peripheral Device Interrupt Control (ARMasm)
 - ▣ High-Level Device Control (ARM-C)

Detail Diagram (Board)



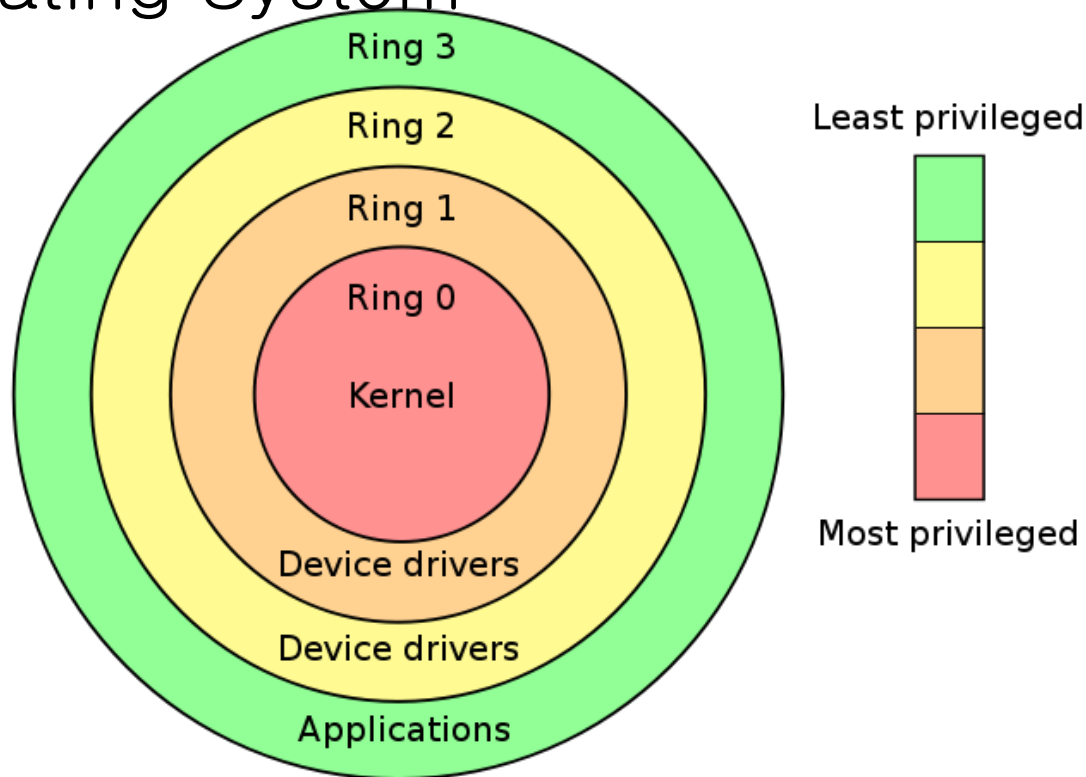
Issue of Project (1)

- Transfer data from Python-App to MASM App



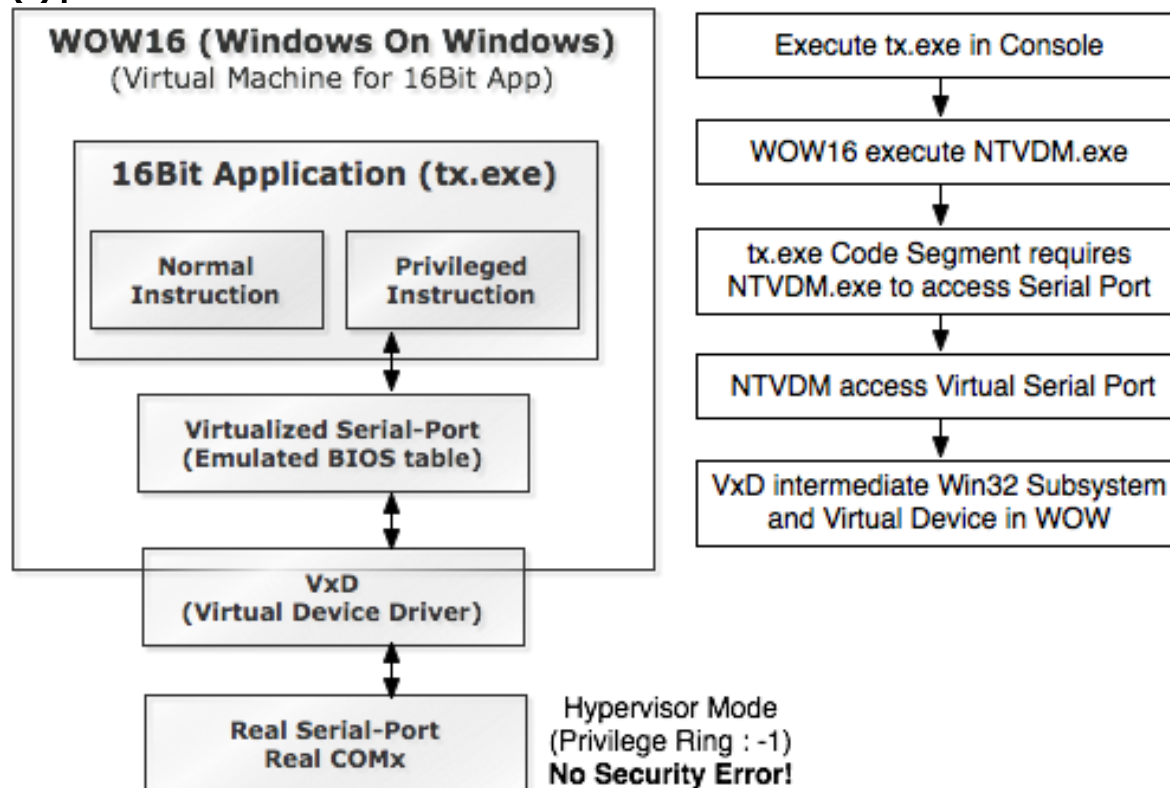
Issue of Project (2)

- Privileged Instruction Protection in Operating System



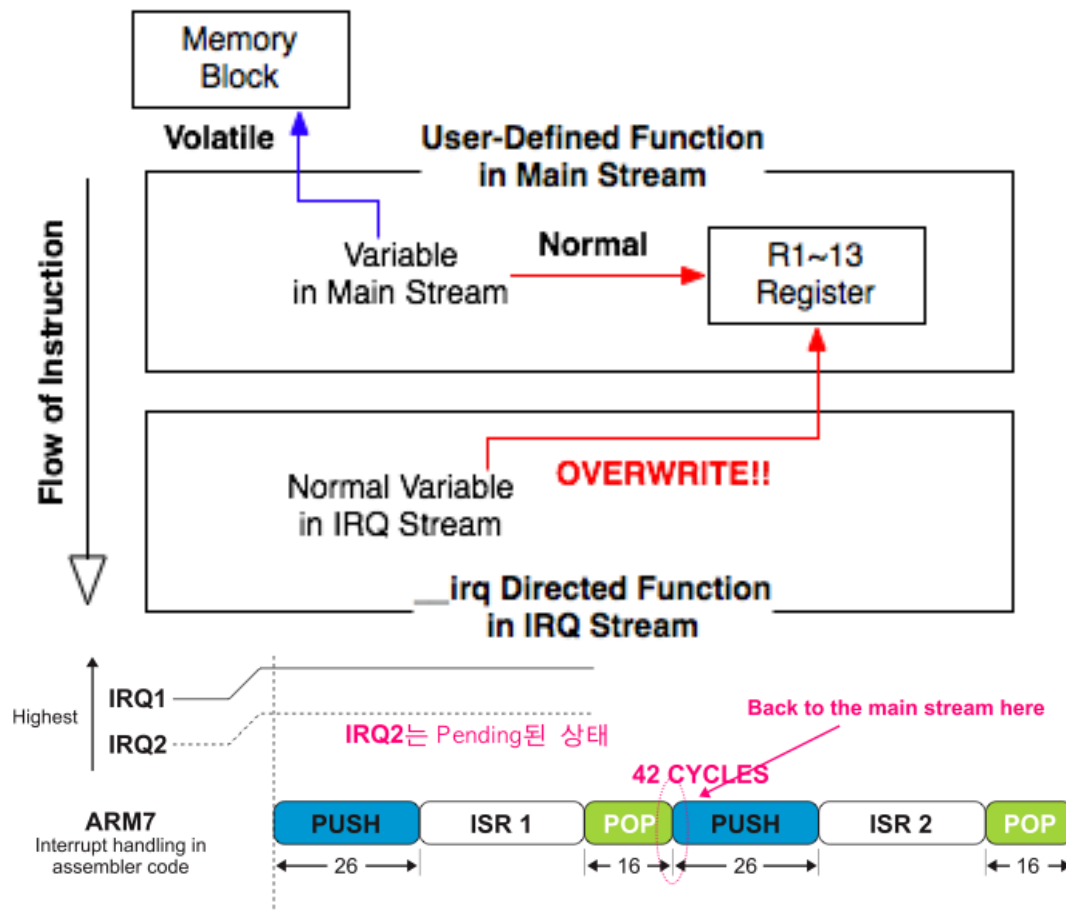
Issue of Project (2)

- Use NTVDM to overcome protection of port control



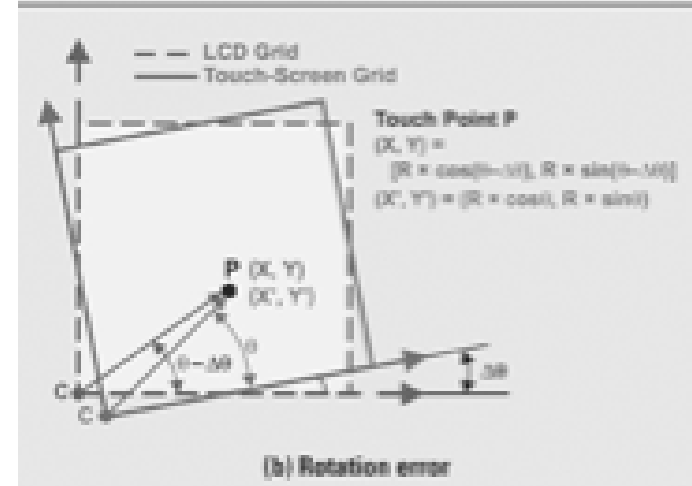
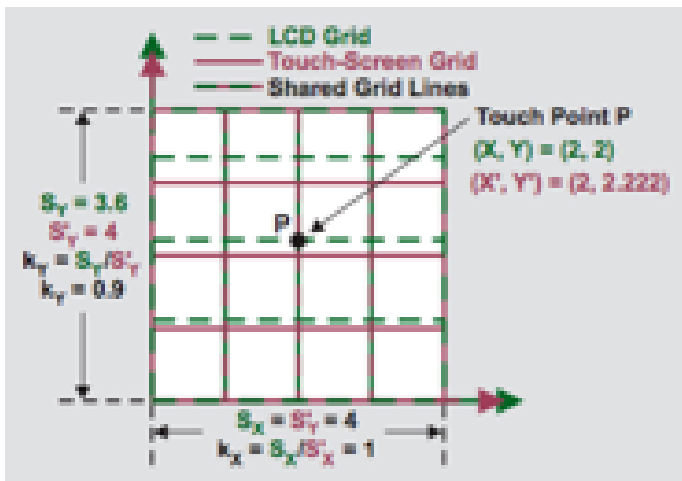
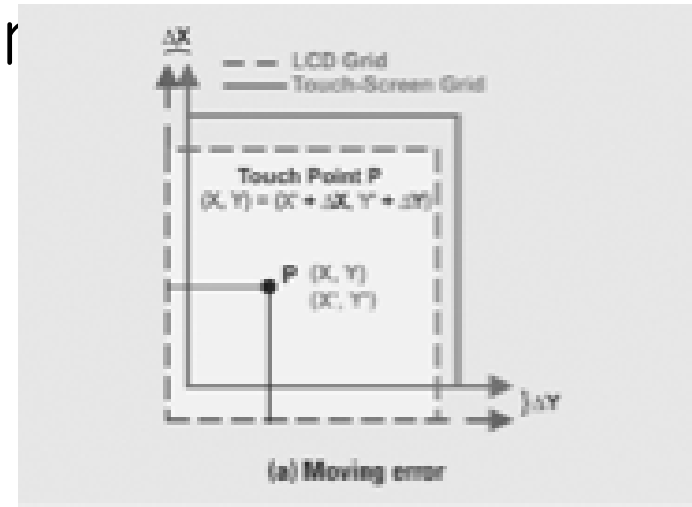
Issue of Project (3)

- CPU Latency during IRQ Function Execution Time



Issue of Project (4)

- Touch Screen Calibration
 - ▣ Scaling Factor
 - ▣ Moving Error
 - ▣ Rotation Error



Issue of Project (4)

□ Calculation of Calibration Equation with Matrix

1. Definition of Moving/Rotation Factor

$$\begin{aligned}
 X &= k_X \times R \times \cos(\theta - \Delta\theta) + \Delta X \\
 &= k_X \times R \times \cos\theta \times \cos(\Delta\theta) + k_X \times R \times \sin\theta \times \sin(\Delta\theta) + \Delta X \\
 &= k_X \times X' \times \cos(\Delta\theta) + k_X \times Y' \times \sin(\Delta\theta) + \Delta X \quad (1) \\
 &= \alpha_X \times X' + \beta_X \times Y' + \Delta X,
 \end{aligned}$$

α_X, β_X is Rotation Factor of X ΔX is Moving Factor of X

$$\begin{aligned}
 Y &= k_Y \times R \times \sin(\theta - \Delta\theta) + \Delta Y \\
 &= k_Y \times R \times \sin\theta \times \cos(\Delta\theta) - k_Y \times R \times \cos\theta \times \sin(\Delta\theta) + \Delta Y \\
 &= k_Y \times Y' \times \cos(\Delta\theta) - k_Y \times X' \times \sin(\Delta\theta) + \Delta Y \quad (2) \\
 &= \alpha_Y \times X' + \beta_Y \times Y' + \Delta Y,
 \end{aligned}$$

α_Y, β_Y is Rotation Factor of Y ΔY is Moving Factor of Y

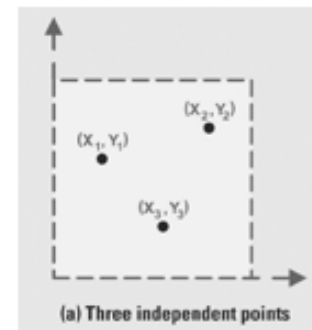
3. Matrix Conversion & Calculation

$$\begin{aligned}
 X_1 &= \alpha_X \times X'_1 + \beta_X \times Y'_1 + \Delta X \\
 X_2 &= \alpha_X \times X'_2 + \beta_X \times Y'_2 + \Delta X \\
 X_3 &= \alpha_X \times X'_3 + \beta_X \times Y'_3 + \Delta X
 \end{aligned}
 \quad \longrightarrow \quad
 \begin{pmatrix} X_1 \\ X_2 \\ X_3 \end{pmatrix} = A \times \begin{pmatrix} \alpha_X \\ \beta_X \\ \Delta X \end{pmatrix} \quad \text{and} \quad \begin{pmatrix} Y_1 \\ Y_2 \\ Y_3 \end{pmatrix} = A \times \begin{pmatrix} \alpha_Y \\ \beta_Y \\ \Delta Y \end{pmatrix}, \quad A = \begin{pmatrix} X'_1 & Y'_1 & 1 \\ X'_2 & Y'_2 & 1 \\ X'_3 & Y'_3 & 1 \end{pmatrix}$$

$$\begin{aligned}
 Y_1 &= \alpha_Y \times X'_1 + \beta_Y \times Y'_1 + \Delta Y \\
 Y_2 &= \alpha_Y \times X'_2 + \beta_Y \times Y'_2 + \Delta Y \\
 Y_3 &= \alpha_Y \times X'_3 + \beta_Y \times Y'_3 + \Delta Y
 \end{aligned}
 \quad \xrightarrow{\text{Representation to Matrix}} \quad
 \begin{pmatrix} \alpha_X \\ \beta_X \\ \Delta X \end{pmatrix} = A^{-1} \times \begin{pmatrix} X_1 \\ X_2 \\ X_3 \end{pmatrix} \quad \text{and} \quad \begin{pmatrix} \alpha_Y \\ \beta_Y \\ \Delta Y \end{pmatrix} = A^{-1} \times \begin{pmatrix} Y_1 \\ Y_2 \\ Y_3 \end{pmatrix}$$

Calculate Factor with Inversion Matrix

2. 3-Point Calibration

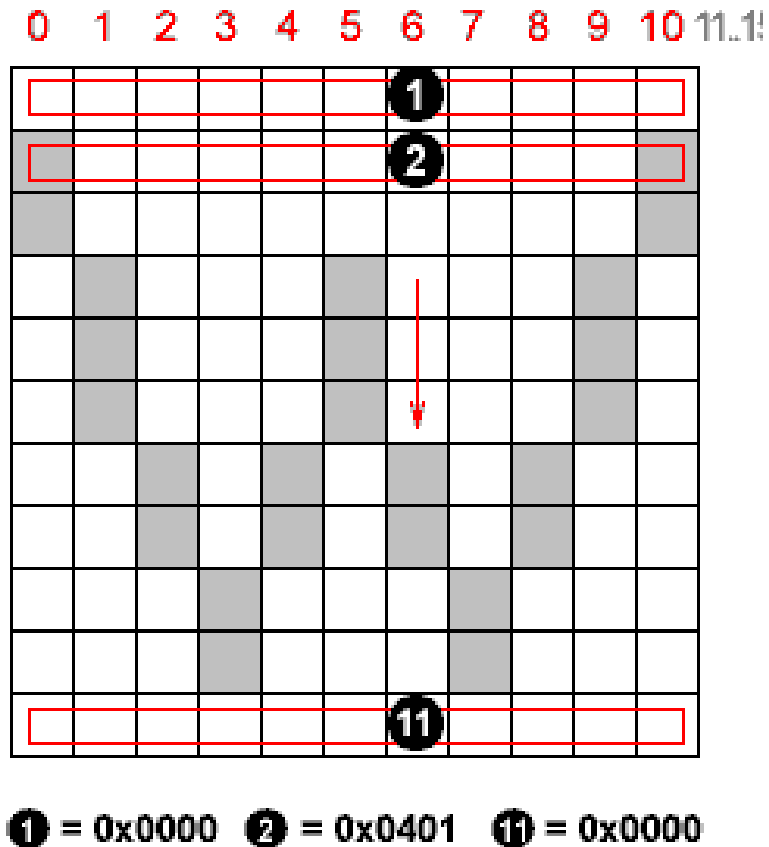


(a) Three independent points

Non-Linear Properties of 3

Issue of Project (5)

- Text Output to LCD



Result of Project

- PC Application
 - ▣ RX.exe : Receive URL from UART and Save(MASM)
 - ▣ HTTP.exe : Receive HTML from Ethernet and Save (PY)
 - ▣ TX.exe : Send HTML to UART (MASM)

- ARM Application
 - ▣ Stack-based HTML Parser
 - ▣ Touch-Screen Keyboard
 - ▣ TX/RX Communication Module (in ARM Assembly)



DEMO

THANK YOU!!

Reference Documents:

S3C2410X User Manual

S3C2410X Application Note

ARM Architecture Reference Manual

ARM920T Technical Reference Manual

Reference Code:

MS MASM32 Sample Code

AVR GLCD Control Sample Code

UART-Communication TASM Sample Code