gamelad – a gameboy emulator for STM32F4

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1 Introduction

My intention intention with this project was to understand better how computer hardware works. That's the reason why I chose to emulate a simple hardware such as GameBoy.

The original GameBoy has custom CPU based on the Intel 8080 with the instruction set borrowed from the Zilog Z80. The chip's official name is Sharp LR35902 and it's clocked at 4MHz.

The GB also has: a screen resolution of 160×144 (20×18 tiles) and four colours (grayscale); 0xFFFF memory space with adressable registers and lots of memory magic; an interrupt system; timers and different memory bank controllers which allowed for additional hardware on cartridges. Only MBC1 cartridge emulation was attempted (maximum of 2MB ROM and 32KB of RAM).

2 Gamepad

A six-button Sega Genesis/Mega Drive controller was used. Which has four directions, a start button and six game buttons (A,B,C,X,Y,Z). As the original GameBoy had only two game buttons (A and B) and START and SELECT buttons besides the four directions technically a 3 button controller could have also been used and the coding should work the same for this kind of controller. The only reason I had to use the 6-button version is because nowadays it's more afordable ($5.22 USD at amazon). The top three buttons (X, Y and Z) are not being used, because they are unnecessary for gameboy emulation.

GENESIS	GAMEBOY
directions	directions
START	START
A	B
B	A
C	SELECT

Table 1: Button equivalences.

The gamepad has been wired to the board as shown in the table Table 2.

References

[1] Game Boy ™CPU Manual. `http://marc.rawer.de/Gameboy/Docs/GBCPUman.pdf`

[2] GAME BOY programming manual. `http://students.washington.edu/fidelp/galp/megaguides/GameBoyProgrammingManual.pdf`

[3] Everything You Always Wanted To Know About GAMEBOY. `http://www.devrs.com/gb/files/gbspec.txt`

[4] Sega Six Button Controller Hardware Info `http://www.cs.cmu.edu/~chuck/infopg/segasix.txt`

[5] STM32F4DIS-BB User Manual

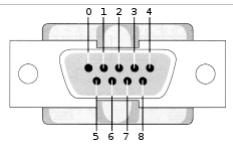	Description	STM32F4-BB PIN	name	STM32F4 GPIO
0	V_{cc}	40	+3V	-
1	RIGHT	28	GPIO6	GPIOA 10
2	LEFT	18	GPIO2	GPIOA 5
3	DOWN	24	GPIO4	GPIOA 8
4	UP	16	GPIO1	GPIOD 11
5	START/C	5	UART1_TXD	GPIOB 6
6	GND	10	GND	-
7	Select Signal	22	GPIO3	GPIOA 15
8	A/B	26	GPIO5	GPIOA 3

Table 2: Button equivalences.