FOX-1 Camera Board

Software Group

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Overview

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- System Operation Flowchart
- Programming Task List
- State of Development

Key Components

System Architecture

- Processor: STM32L151ZDT6
- Operating System: ChibiOS/RT

Hardware Capabilities

- 32MHz Processor @ 238 uA/MHz
- 382 KB ECC Flash, 48 KB SRAM, 12 KB ECC EEPROM
- 382 KB Dual-Port DRAM FIFO
- 1Mb 40MHz SPI MRAM
- 400 kHz SCCB (I2C compatible) Camera Control
- Two 19.2 kbaud UART

Operating System

Key Features

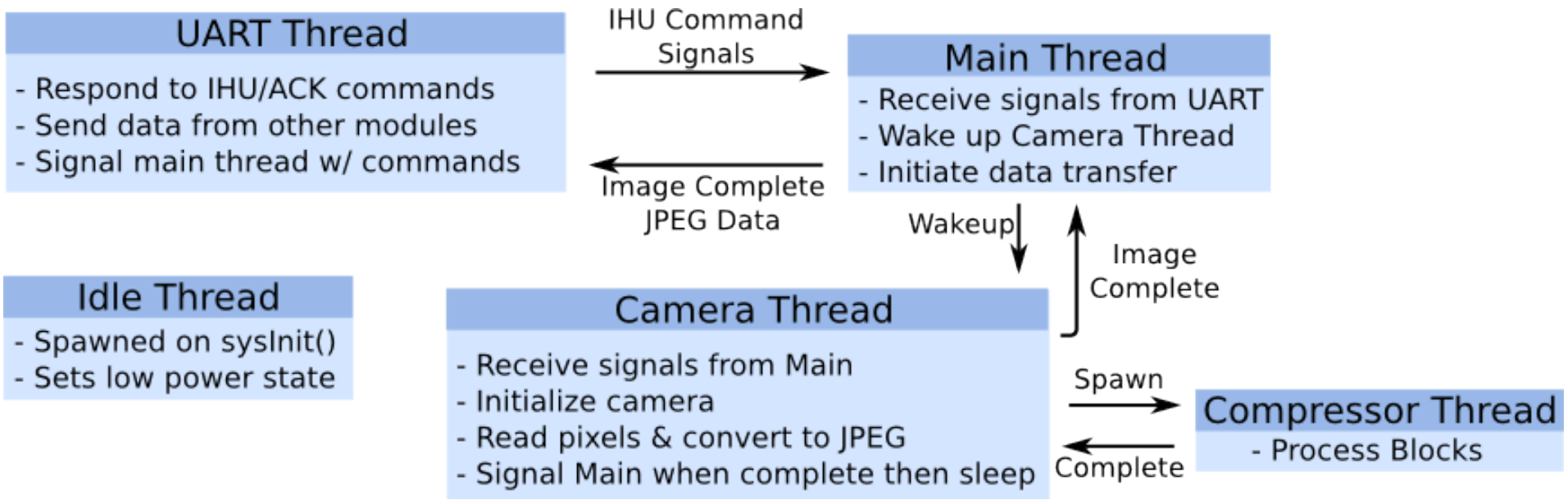
- 1.2-5.5 KiB Kernel Size
- 128 thread priority levels
- Preemptive scheduling, Round-Robin schedular for like priorities
- Mutexes, Semaphores, Events, Message Queues
- Thread-safe Heap
- Hardware Abstraction Layer with DMA support for STM32L1
- GPLv3

JPEG Compressor

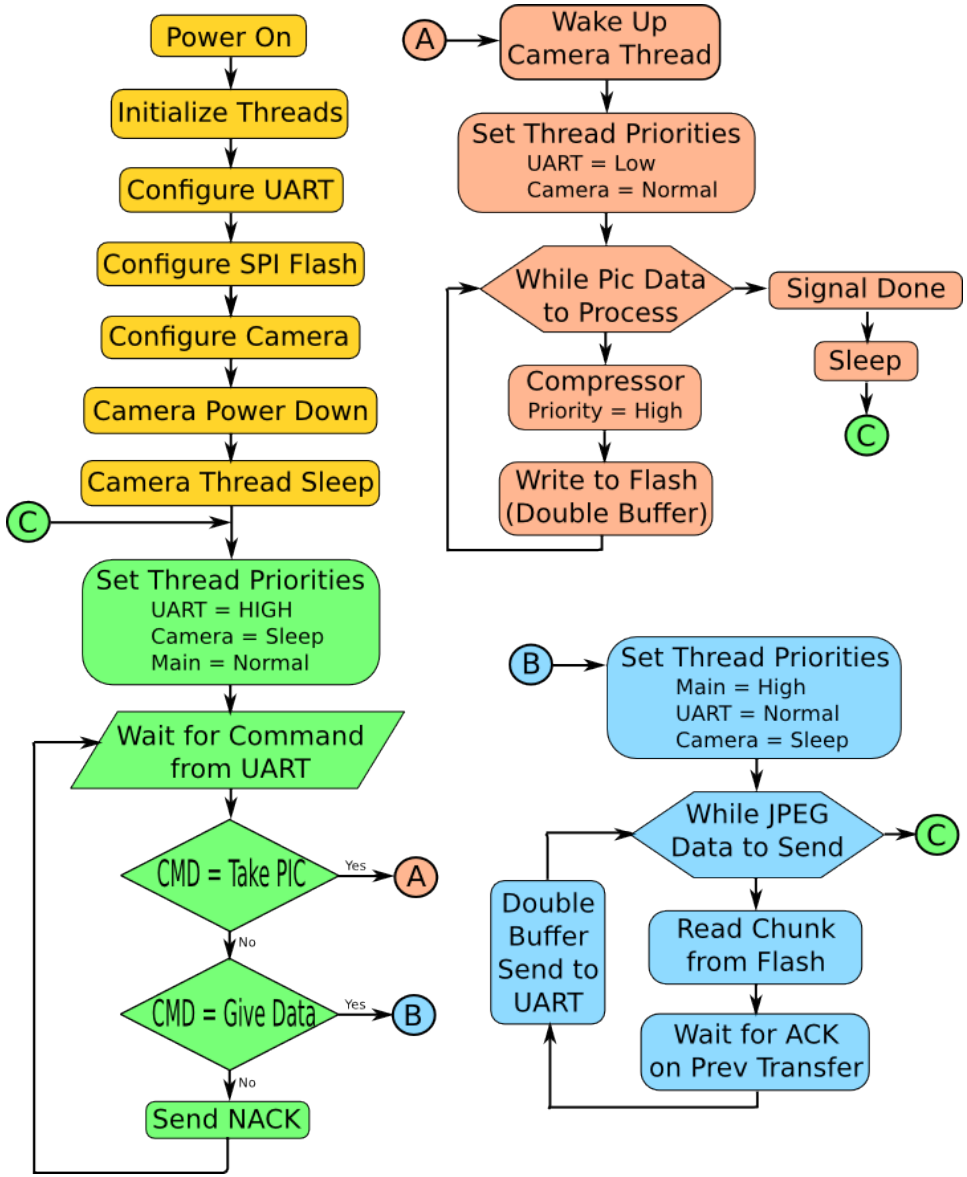
jpegant

- JPEG Compressor code is based off the jpegant lightweight JPEG library
- Integer DCT
- Low memory footprint
- GPLv2 (Author will re-release under GPLv3 per our request)

Task Diagram



System Operation Flowchart



Programming Task List

Programming Task List

Interface Task List

Interface: USART3

Used By: UART Thread, IHU

Specification: 19200 Baud, no flow control

Development:

Functionality	Completed	Tested
TX Bytes	Yes	Yes
RX Bytes	Yes	Yes
Parse Commands	Yes	Yes
Documentation	Yes	

Interface: UART1/4

Used By: Debug output (UART1 on dev. Board, UART4 on final release)

Specification: 19200 Baud, no flow control, Debug output

Development:

Functionality	Completed	Tested
TX Bytes	Yes	Yes
Documentation	No	

Interface: SPI 1

Used By: Main Thread, Camera Thread, SPI Flash

Specification: 8Mbit SPI Flash, 66 MHz maximum bus speed (dev. Board), 1Mbit SPI MRAM (40 MHz maximum) release

Development:

Functionality	Completed	Tested
Write Byte	Yes	Yes
Write Bytes	Yes	Yes
Read Byte	Yes	Yes
Read Bytes	Yes	Yes
Erase Sector/Block	Yes	Yes
Threadsafe	Yes	No
Documentation	Yes	

Interface: I2C 1

Used By: Camera Thread

Specification: OmniVision SCCB (I2C Compatible) 400 kHz

Development:

Functionality	Completed	Tested
Write Register	Inwork	No
Read Register	No	No
Configure Camera	Inwork	No
Confirm Sanity	No	No
Documentation	Inwork	

Interface: FIFO

Used By: Camera Thread, Camera, FIFO

Specification: Dual Port DRAM w/ independent write/read pointers

Development:

Functionality	**Completed**	**Tested**
Initialize	No	No
Read Byte	No	No
Read 640x8 Bytes	No	No
Reset	No	No
Documentation	No	

Threading Task List

UART Thread

Development:

Functionality	Completed	Tested
Rx events from peripheral	Yes	Yes
Tx signals to Main Thread	No	No

Main Thread

Development:

Functionality	Completed	Tested
Rx signals from UART Thread	No	No
Wake Camera Thread	No	No
Rx signals from Camera Thread	No	No
Change Thread Priorities	No	No

Camera Thread

Development:

Functionality	Completed	Tested
Sleep	No	No
Wake on command	No	No
Tx signals to Main Thread	No	No
Spawn Compressor Thread	No	No

Compressor Thread

Development:

Functionality	Completed	Tested
Return status on completion	No	No

Compressor Task List

Development:

Functionality	**Completed**	**Tested**
PC Test on BMP image	Yes	Yes
PC Test on raw RGB values	Yes	Yes
PC Test with 444,422,420	Yes	Yes
uC Test with YCbCr	Inwork	No
UC Test with Camera	No	No
Documentation	Inwork	

State of Development

- STM32L152xB Development Boards received on Tuesday
- Existing STM32F4 code ported and runs successfully as of Tuesday
- OV7670 SCCB Interface is in work
- Need to discuss interface communications with IHU folks