MSE2202B Prototype Specification Document

* Electronics, Sensors and Actuators
  + Main MCU
    - STM32 Variant, 180 MHz ARM Cortex-M4
  + Sensors
    - Magnetic
      * ST LSM303
        + 1x Located on claw for cube detection
      * NXP MAG3110
        + 1x Located on rear chassis for cube detection for accurate pyramid placement
    - Distance
      * VEX Ultrasonic Rangefinder
        + 2x located on left side for parallel wall following
        + 1x located on front side for turning
    - IR
      * TSOP32338
        + 1x located on rear for Pyramid detection
        + 1x located on rear for Pyramid detection (with focusing shroud)
    - DC Motors, All controlled via VEX 29 Motor Controller
      * VEX DC motor
        + 1x located on claw linear slide
        + 3x located on pyramid lift
        + 2x located on chassis for drivetrain
    - Servo Motors
      * VEX Servo
        + 1x located on claw
    - Wireless Communications
      * ESP8266 WiFi Module
        + 1x for user to issue start and stop commands via a phone of computer
    - Misc.
      * Limit Switches
        + 2x located on claw linear slide

Connected as interrupts to GPIO ports

* + - * + 2x located on pyramid lift

Connected as interrupts to GPIO ports

MCU Features:

Controller that was intended to be used: Was not used due to malfunction

* STM32F446RET6 in LQFP64 package
* ARM®32-bit Cortex®-M4 CPU with FPU
* Adaptive real-time accelerator (ART Accelerator™) allowing 0-wait state execution from Flash memory
* 180 MHz max CPU frequency
* VDD from 1.7 V to 3.6 V
* 512 KB Flash
* 128 KB SRAM System
* 4 KB SRAM Backup
* Timers General Purpose (10)
* Timers Advanced-Control (2)
* Timers Basic (2)
* SPI (4)
* I2S (2)
* USART (4)
* UART (2)
* USB OTG Full Speed and High Speed
* CAN (2)
* SAI (2)
* SPDIF-Rx (1)
* HDMI-CEC (1)
* Quad SPI (1)
* Camera Interface
* GPIO (50) with external interrupt capability
* 12-bit ADC (3) with 16 channels
* 12-bit DAC with 2 channels

Controller used on prototype for competition:

* STM32F429ZIT6 in LQFP144 package
* ARM®32-bit Cortex®-M4 CPU with FPU
* 180 MHz max CPU frequency
* VDD from 1.8 V to 3.6 V
* 2048 KB Flash
* 256+4 KB SRAM, including 64 KB of CCM (core coupled memory) data RAM
* GPIOs (114) with external interrupt capability
* 16-stream DMA controller with FIFOs and burst support
* 12-bit ADCs with 24 channels (3)
* 12-bit DAC channels (2)
* USART/UART (4)
* I2C (3)
* SPI (6)
* Advanced-control Timer (2)
* General Purpose Timers (10)
* Watchdog Timers (2)
* CAN 2.0B active (2)
* SAI
* SDIO
* Random Generator (TRNG for HW entropy)
* USB 2.0 OTG HS
* USB 2.0 OTG FS
* Camera interface
* Ethernet
* LCD-TFT