

# MSP430 Tank

Group Members:

Andrew Blanford

Krishnaveni Das

Matthew Drummond

Byron Pollard

Dheeraj Reddy

The goal of the project is to design and implement a radio controlled (RC) tank vehicle. The vehicle will be able to drive and steer using a remote control. It will also have the ability to aim and launch a projectile weapon mounted on the vehicle. The operator will have the ability to control all vehicle functions from the remote control. The following descriptions and design decisions are based on the MSP430G2553 included with the TI LaunchPad Development Kit.

## **Chassis**

The vehicle chassis will be built using Vex Robotics components and will include a tracked drive system. The chassis will support a rotating turret mount as well as provide mounting for the MSP430 Launchpad, battery pack and motors.

## **Drive Motors**

The chassis will support left and right drive motors which will be controlled independently. The motors will be Vex Robotics Motor Modules with three input wires: power, ground, control. The control signal is a PWM with the center value as "off." These PWMs can be driven using compare channels on Timer\_A1 with each motor having its own channel and output. The control signal level is independent of the power input.

## **RC Control**

The RC remote transmits via radio frequency to an RF decoder. The decoder has three signals: power, ground, and PPM. The PPM signal (pulse position modulation) can be decoded by timing the interval between the rising edges of the signal. This can be accomplished with a capture channel on Timer\_A0.

*Alternate control method: TI Wireless Booster Pack if RF control proves too challenging.*

## **Turret** (Horizontal rotation, no pitch control)

The pivoting turret will also be controlled with either a Vex Robotics Motor Module or a separate servo motor and will use the third and final channel of Timer\_A1. The turret will only have horizontal control, there will be no pitch control.

## Weapon and Firing Mechanism

The mounted weapon will be a small Nerf gun that has a simple trigger for firing. The weapon will be loaded and cocked prior to operation, there will be no remote control mechanism for either of those actions. In order to pull the trigger we will be using a servo motor. The servo motor will be using a similar type of PWM interface as the Vex Robotics motors. Alternately, a simple digital signal may be used to activate a solenoid to release a trigger.

## Power Source

Vex motors can each be powered with a 9V battery and should be separately grounded/powerd from the microcontroller due to noise. The MSP430 will be powered using the same or possibly a separate battery with a voltage divider to provide the correct input voltage.

## Possible Expansion Components

Additional components can be added through basic digital I/O pins to provide additional functionality. Other features that can be added given sufficient time include an ultrasonic sensor which could determine distance away from a target and cause the weapon to fire. Simple sensors could trigger an interrupt when a collision is detected. LEDs could be added to serve as “tail lights” or an “armed” indication.

### Expected Pin Function

Pin Number	Pin Name	Tank Function
1	VCC	Power
4	TA0.1	RF Decoder Capture
7	TA1.0	PWM Output, Turret motor
8	TA1.1	PWM Output, Left Motor
11	P2.1	Trigger Mechanism
12	TA1.2	PWM Output, Right Motor
20	VSS	Ground