GDS-1 robot circuits overview

This archive contains a series of 5 circuits, that form the control electronics of GDS-1 robot. It's a remote controlled robot, featuring:

- moving forward, reverse, left, right, spinning left or right, with 10 different speeds
- a sonar sensor
- four on/off bumpers (switch, IR, or other type)
- a switchable LED light
- four independent channels for RC servo motors, for example to pan and tilt a video camera
- two independent relays, to switch on/off big electrical devices
- all remotely controlled by a series of commands, that can be transmitted on top of a Bluetooth or Wifi connection
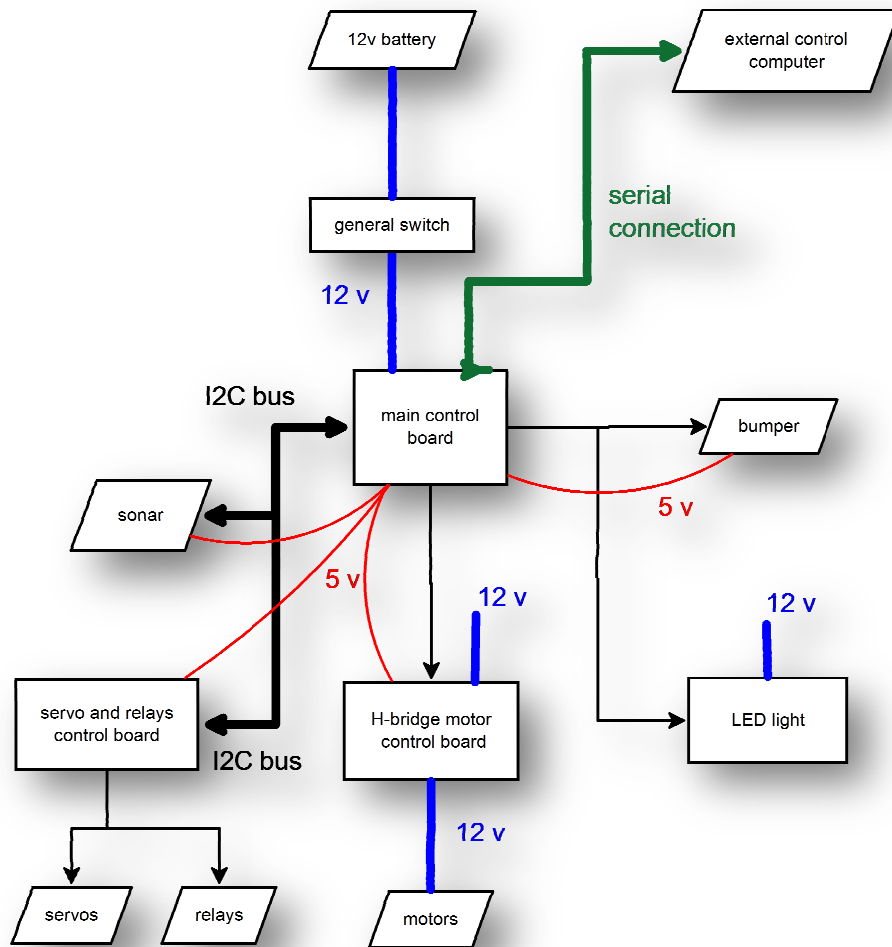
The robot power is provided from 12v DC source, typically a battery.

The circuits represents the core robot electronics, comprising two microcontrollers, a Pic 16F628 and a Pic 16F88, plus other components. The main microcontroller receives command from an external control computer (motor speed, moving direction, servo positions, relay and light on or off), and sends to it sonar and bumper readings. The control computer could be mounted locally on robot, or could be a remote computer connected via some type of radio connection.

The main micro sends and receives commands and data by a standard serial TTL connection, allowing a great freedom in choosing how to transmit locally or remote serial packets in a number of different modes. Some of them:

- a serial to USB module, if you want to use a netbook or similar on the robot
- a serial to bluetooth module, if you want to transmit directly to a remote control computer
- a simple serial cable, if you want to connect a computer on the robot having a serial port (for example a Palm computer)

All the circuits are powered by 5v DC source. The main microcontroller board contains a 12v to 5v converter, with a 5v output connector. So all others boards and circuits can be powered directly from main board.

The robot needs other external electronical devices to work:

- a sonar;
- a serial connection device , depending on what transmission mode was choosed: serial to USB module; serial to bluetooth module; cable; etc.

If you want to use the attached microcontroller programs, there are only these restrictions:

- the microcontroller oscillator frequency is 20 mhz
- all sonar timing and other parameters are for a Devantech SRF02 mini sonar connected by an I2C bus (distance readings are in cm)
- the bumpers must have a TTL output line, where +5v = off (no contact); GND = on (obstacle contact)
- the servo motors have to be standard RC ones (as that produced by Futaba, Hitec, and others)

All files in this archive are in Circad V 5 format. Circad is a PCB design package, available in different version at:

http://www.holophase.com/

Every Circad PCB project comprises three files with extension: .sch (schematic); .pcb (component placement); .net (schematic net list).

The circuits are as follow:

1) robot-board: the main circuit, contains a PIC 16F628 type microcontroller that receives command from remote control computer, and sends it the sensor readings (sonar, and switch or IR bumpers). This circuit comprises also a 12v to 5v converter.

2) H-bridge: the motor control circuit, interfacing microcontroller in main circuit to two 12v DC motors

3) servo-relays-robot-board: an auxiliary circuit, comprises another microcontroller (PIC 16F88) that controls up to 4 RC type servo motors, and 2 relays. This board is connected to main circuit by an I2C bus

4) robot-general-switch: a simple circuit for the general robot electrical switch

5) LED-light: a simple circuit with four bright LED in series on 12v power, it contains a transistor used as a switch by the main microcontroller.