Computer and microcontroller course WS22/23

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Infra-red controlled robot car

The robot car consists of four DC motors (wheels) that all connect to a L298N H-Bridge driver motor chip that provides power to the four motors via a battery pack with six 1.5V batteries connected in series. The DC motors are controlled by the Arduino Uno, which receives infra-red signals from a remote control.

The communication between Arduino and remote transmitter is governed by the NEC infrared transmission protocol. The carrier frequency of the remote control is set to 38.4kHz. The message consists of a starting block, an address block (8 bits address + 8 bits inverted address) and a command block (8 bits command + 8 bits inverted command). A logical '0' in the message consists of a 562.5µs wide HIGH pulse followed by a 562.5µs LOW pulse. A logical '1' consists of a 562.5µs wide HIGH pulse followed by a 1.6875µs LOW signal. However the signals transmitted by the remote control are inverted therefore the message has to be inverted as well while decoding the receiving signal. An example of a NEC transmission can be seen in figure 1.

After pressing a button on the remote control the 4 motors are enabled for half a second and are then turned off again, waiting for another user input. The robot car can drive into six different directions (forward, left and right curve and everything backwards respectively). A short video of the car in action can be seen here on youtube.

The corresponding code was written entirely in C and additionally USART (universal synchronous/asynchronous receiver/transmitter) was implemented for debugging purposes.

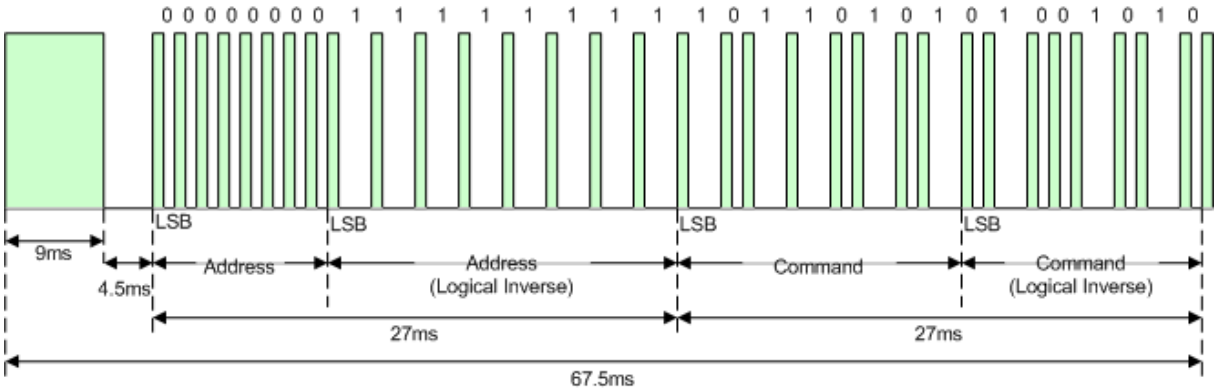

Figure 1: Example message of a NEC protocol transmission. After a 9ms HIGH pulse, followed by a 4.5ms LOW pulse the infrared message transmission starts, consisting of 32 bits in total.

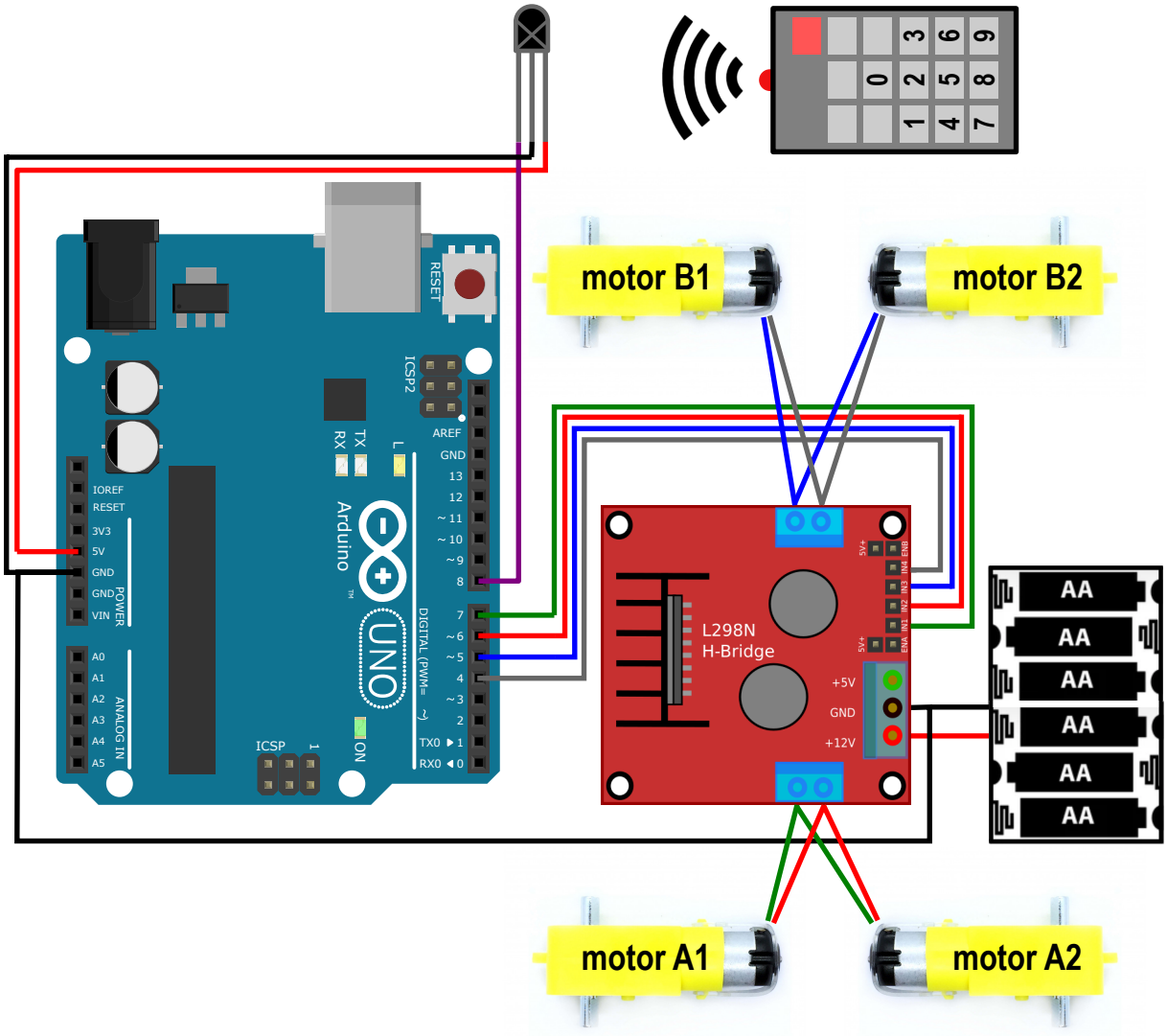

Figure 2: Circuit diagram of robot car controlled by a Arduino Uno microcontroller.

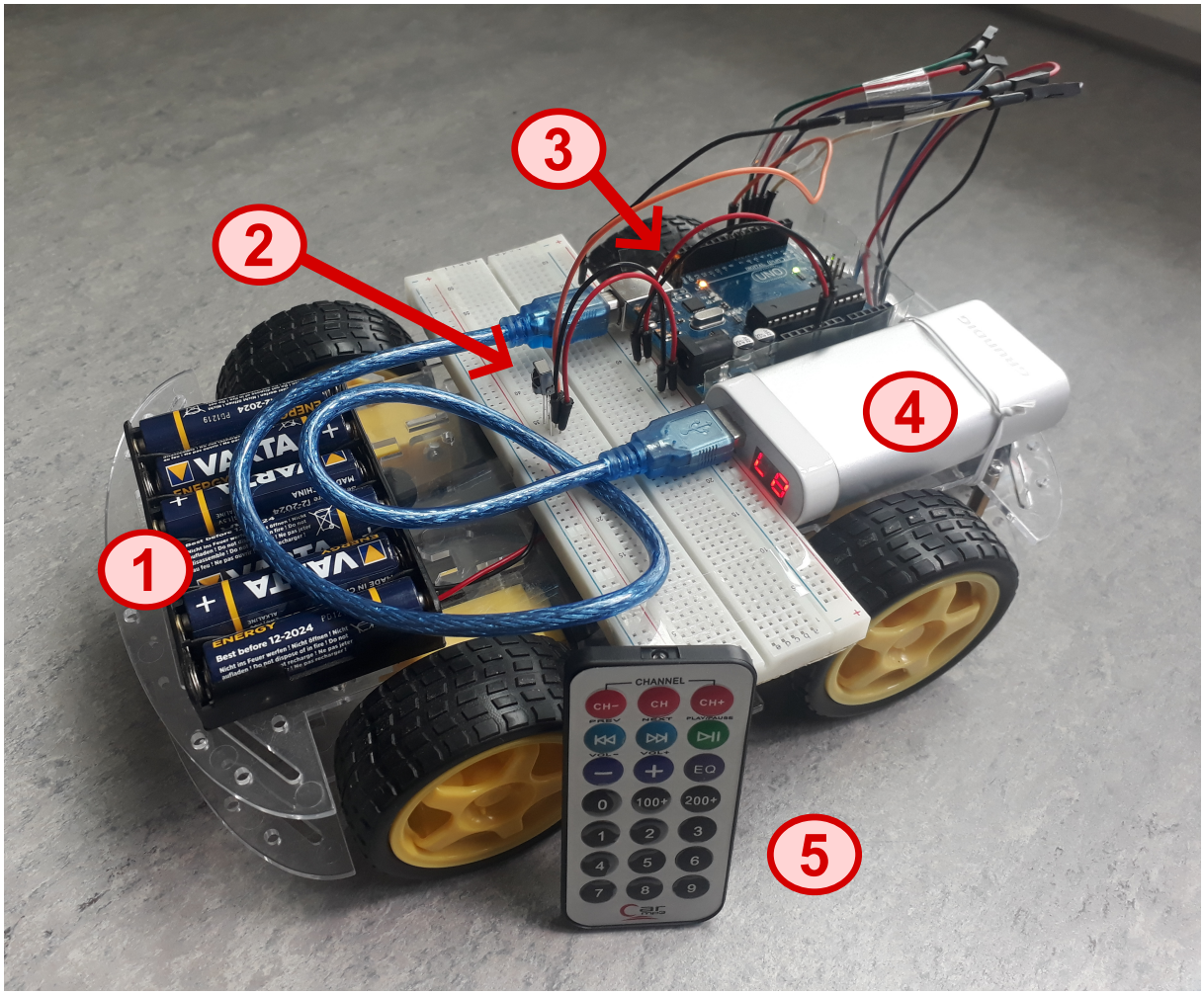

Figure 3: Picture of the finished construction of the robot car including (1) six 1.5V AA batteries, that power the L298N motor driver (hidden under the chassis), (2) an infra-red receiver, (3) the Arduino Uno, (4) a powerbank to power it and (5) an infra-red remote control.