Arduino RFID Library for MFRC522

286 commits 2 branches 7 releases 34 contributors

miguelbalboa Merge pull request #190 from Rotzbua/patch-collision ... Latest commit 55feec4 on 18 Feb

doc	Corrected labeling and swapped GND and RST pins in Fritzing schematic.	5 months ago
examples	Merge branch 'upstream/master'	a month ago
.gitignore	Add gitignore	2 months ago
.travis.yml	Merge branch 'master' into new-travis	a month ago
MFRC522.cpp	Merge branch 'new-travis' into patch-collision	a month ago
MFRC522.h	Merge branch 'new-travis' into patch-collision	a month ago
Makefile	Added makefile to help package	a year ago
README.rst	extend travis test for different boards	a month ago
UNLICENSE	Adding explicit UNLICENSE file	a year ago
changes.txt	Bump Version to 1.1.8	a month ago
keywords.txt	add output SAK to dump functions	a month ago
library.json	Bump Version to 1.1.8	a month ago
library.properties	Bump Version to 1.1.8	a month ago

README.rst

MFRC522

build passing

Arduino library for MFRC522 and other RFID RC522 based modules.

Read and write different types of Radio-Frequency IDentification (RFID) cards on your Arduino using a RC522 based reader connected via the Serial Peripheral Interface (SPI) interface.

Set the UID, write to sector 0, and unbrick Chinese UID changeable MIFARE cards.

Compatible boards

This library is compatible to Teensy and ESP8266, but not all examples are available for every board. Also you have to change pins, see pin layout.

Pin Layout

The following table shows the typical pin layout used:

	PCD	Arduino					Teensy		
	MFRC522	Uno	Mega	Nano v3	Leonardo / Micro	Pro Micro	2.0	++ 2.0	3.1

Signal	Pin	Pin	Pin	Pin	Pin	Pin	Pin	Pin	Pin
RST/Reset	RST	9 [1]	5 [1]	D9	RESET / ICSP-5	RST	7	4	9
SPI SS	SDA [3]	10 [2]	53 [2]	D10	10	10	0	20	10
SPI MOSI	MOSI	11 / ICSP-4	51	D11	ICSP-4	16	2	22	11
SPI MISO	MISO	12 / ICSP-1	50	D12	ICSP-1	14	3	23	12
SPI SCK	SCK	13 / ICSP-3	52	D13	ICSP-3	15	1	21	13

[1]	*(1, 2)* Configurable, typically defined as RST_PIN in sketch/program.

[2]	*(1, 2)* Configurable, typically defined as SS_PIN in sketch/program.

[3]	The SDA pin might be labeled SS on some/older MFRC522 boards.

Hardware

There are three hardware components involved:

1. **Micro Controller**:

- An Arduino or compatible executing the Sketch using this library.
- Prices vary from USD 7 for clones, to USD 75 for "starter kits" (which might be a good choice if this is your first exposure to Arduino; check if such kit already includes the Arduino, Reader, and some Tags).

2. **Proximity Coupling Device (PCD)**:

- The PCD is the actual RFID **Reader** based on NXP MFRC522 Contactless Reader Integrated Circuit).
- Readers can be found on eBay for around USD 5: search for *"rc522"*.
- You can also find them at several web stores, they are often included in *"starter kits"*; so check your favourite electronics provider as well.

3. **Proximity Integrated Circuit Card (PICC)**:

- The PICC is the RFID **Card** or **Tag** using the ISO/IEC 14443A interface, for example Mifare or NTAG203.
- One or two might be included with the Reader or *"starter kit"* already.

Protocols

1. The micro controller and the reader use SPI for communication.

- The protocol is described in the NXP MFRC522 datasheet.
- See the Pin Layout section for details on connecting the pins.

2. The reader and the tags communicate using a 13.56 MHz electromagnetic field.

- The protocol is defined in ISO/IEC 14443-3:2011 Part 3 Type A.
  - Details are found in chapter 6 *"Type A – Initialization and anticollision"*.
  - See http://wg8.de/wg8n1496_17n3613_Ballot_FCD14443-3.pdf for a free version of the final draft (which might be outdated in some areas).
  - The reader does not support ISO/IEC 14443-3 Type B.

Security

This library only supports crypto1-encrypted communication. Crypto1 has been known as broken for a few years, so it does NOT offer ANY security, it is virtually unencrypted communication. **Do not use it for any security related applications!** This

library does not offer 3DES or AES authentication used by cars like the Mifare DESFire, it may be possible to be implemented because the datasheet says there is support. We hope for pull requests :).

Troubleshooting

- **I don't get input from reader** or **WARNING: Communication failure, is the MFRC522 properly connected?**
  i. Check your connection, see Pin Layout .
  ii. Check voltage. Most breakouts work with 3.3V.
  iii. SPI only works with 3.3V, most breakouts seem 5V tollerant, but try a level shifter.
  iv. According to reports #101, #126 and #131, there may be a problem with the soldering on the MFRC522 breakout. You could fix this on your own.
- **Sometimes I get timeouts** or **sometimes tag/card does not work.**
  i. Try other side of the antenna.
  ii. Try to decrease distance between MFRC522.
  iii. Increase antenna gain per firmware: `mfrc522.PCD_SetAntennaGain(mfrc522.RxGain_max);`
  iv. Use better power supply.
  v. Hardware may be corrupted, most products are from china and sometimes the quality is really poor. Contact your seller.
- **My tag/card doesn't work.**
  i. Distance between antenna and token too large (>1cm).
  ii. You got the wrong type PICC. Is it really 13.56 MHz? Is it really a Mifare Type A?
  iii. NFC tokens are not supported. Some may work.
  iv. Animal RFID tags are not supported. They use a different frequency (125 kHz).
  v. Hardware may be corrupted, most products are from china and sometimes the quality is really poor. Contact your seller.
  vi. Newer versions of Mifare cards like DESFire/Ultralight maybe not work according to missing authentification, see security or different protocol.
- **My mobile phone doesn't recognize the MFRC522** or **my MFRC522 can't read data from other MFRC522**
  i. Card simmulation is not supported.
  ii. Communication with mobile phones is not supported.
  iii. Peer to peer communication is not supported.
- **I need more features.**
  i. If software: code it and make a pull request.
  ii. If hardware: buy a more expensive like PN532 (supports NFC and many more, but costs about $15)

License

History

The MFRC522 library was first created in Jan 2012 by Miguel Balboa (from http://circuitito.com) based on code by Dr. Leong (from http://B2CQSHOP.com) for *"Arduino RFID module Kit 13.56 Mhz with Tags SPI W and R By COOQRobot"*.

It was translated into English and rewritten/refactored in the fall of 2013 by Søren Thing Andersen (from http://access.thing.dk).

It has been extended with functionality to alter sector 0 on Chinese UID changeable MIFARE card in Oct 2014 by Tom Clement (from http://tomclement.nl).