Physikpraktikum für Vorgerückte (VP)

vp.phys.ethz.ch

Instruction Manual

Advanced Physics Lab Electronics D

 $Pirmin\ Berger\ &\ Michael\ Reichmann$

ETH Zürich, Switzerland, May 2, 2018

Abstract

The experiment "Digital Electronic" provides an introduction into modern data taking by operating simple digital circuits utilising an Arduino board. This manual will inform you about the Arduino board, the installation of the required software and the electrical components you will have to use. Basic knowledge on electronics, how to use oscilloscopes, bread boards and power supplies is recommended.

During the experiment you will learn how to build a circuit that measures the temperature, how to operate it using the Arduino board and to modify and improve it using more components.

In case you should already have previous knowledge we will provide many more material and own ideas on implementation are very welcome and can be built consulting the assistants.

Contents

| 1 | Intr | $\operatorname{roduction}$ |
|----------|------|--------------------------------------|
| | 1.1 | Arduino Board |
| | 1.2 | Grove Shield |
| | 1.3 | Transistor |
| 2 | Bas | ics |
| | 2.1 | Installing the Software |
| | 2.2 | Temperature Sensor |
| | 2.3 | Common Collector |
| | 2.4 | Operational Amplifier |
| | 2.5 | Voltage Divider |
| 3 | Set | up and Experimental Procedure |
| | 3.1 | Setting up the Arduino |
| | 3.2 | Blinking LED on Bread Board |
| | 3.3 | Grove Temperature Sensor |
| | 3.4 | Building Your Own Temperature Sensor |
| | 3.5 | Building a Heating System |
| | 3.6 | Building a Cooling System |
| | 3.7 | Read Out the Fan Speed (Advanced) |
| | 3.8 | Adding a Display (Advanced) |
| 4 | Ana | alysis / Protocol |

1 Introduction

- 1.1 Arduino Board
- 1.2 Grove Shield
- 1.3 Transistor

- 2 Basics
- 2.1 Installing the Software
- 2.2 Temperature Sensor
- 2.3 Common Collector
- 2.4 Operational Amplifier
- 2.5 Voltage Divider

3 Setup and Experimental Procedure

- 3.1 Setting up the Arduino
- 3.2 Blinking LED on Bread Board
- 3.3 Grove Temperature Sensor
- 3.4 Building Your Own Temperature Sensor
- 3.5 Building a Heating System
- 3.6 Building a Cooling System
- 3.7 Read Out the Fan Speed (Advanced)
- 3.8 Adding a Display (Advanced)

4 Analysis / Protocol