TEK4EDU Italy – Technology for Education

greenhouseSIM-Easy
mod.T4E-SIM-02-E

Process Simulators

Bluetooth®

Google Play

App

TEK4EDU
mySIM-E

ANDROID
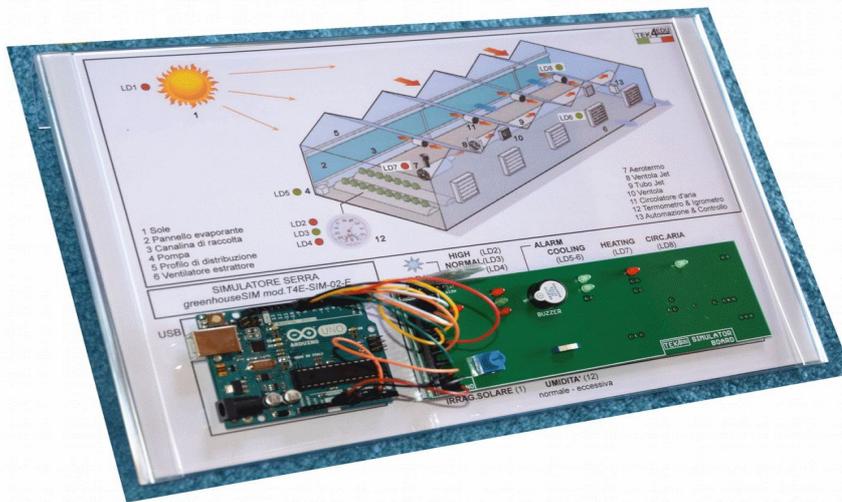
greenhouseSIM-Easy mod.T4E-SIM-02-E is a compact simulator that shows the operation of a Greenhouse for protected cultivation using an **Arduino UNO** board.

The unit is designed to allow the learning of **coding** allowing:
- demonstration of the code (**sketch**) for **Arduino UNO** board handling the simulator
- demonstration of **Apps** that communicate with the simulator via **Bluetooth**

It allows the study and understanding of the functioning of a climatizated greenhouse complete of:
- technology for air heating
- technology for the air cooling
- measurement and control of temperature
- measurement and control humidity
- technology to eliminate heat stratified, humidity and stagnant air

It consistst of:
- a transparent and ergonimic base which contains the block diagram of the system with all main components
- an **Arduino UNO board** and
- an electronic board using **Bluetooth** interface with the already assembled electronic components

The **Bluetooth** interface allows the simulator to connect to a mobile **Android** device (smartphone or tablet).

Wiring is minimal to reduce the chance of errors and the time needed for setting up the exercise:
- only the connection from the Arduino UNO card to the electronic card is required

The **mySIM-E app**, downloadable using the **QRcode** on the page, makes it easy to use the simulator with an **Android** device.

Students, following the instructions of the manual, can build their own **Android** apps that will communicate with the simulator, using:
- simple free apps downloadable by **Google Play or**
- **other development environments, such as MIT App Inventor 2 (AI2)**, which uses drag-and-drop object programming.

The simulator allows the **learning-by-doing** method with which the student has an active role in learning technology:
- Analyze how the system has been designed and modified to evaluate its effects and understand the meaning of the actions taken.

It allows teaching with increasing levels of in-depth, which are modulated by the Teacher.

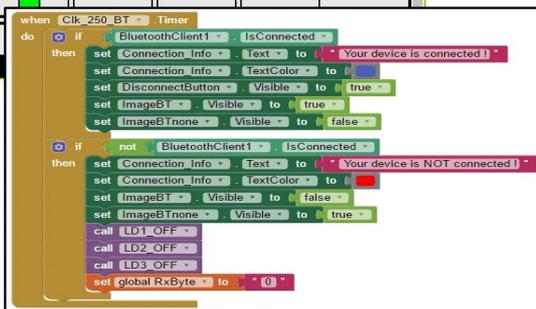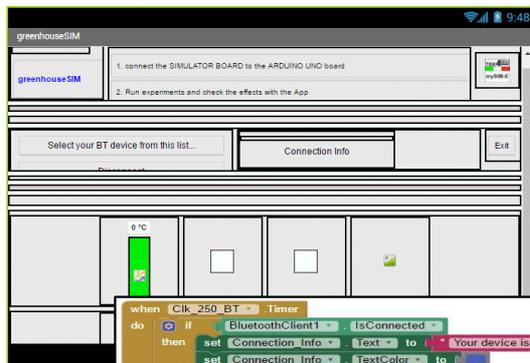It can be used in schools of different level and degree:
- **primary school**: it is possible to demonstrate, very simply, the operating principle of the hydroelectric power station, its simulation (eg adjusting the level of water in the reservoir) and the installation and use of the App
- **Secondary/Vocational school**: the experiences listed in the previous point add to the ability to show the technology adopted and the Arduino code, make code changes to evaluate the effects, and make an App
- **High Level School**: The experiences listed in the previous points add to the greater interaction, creativity and understanding of the codes used for the Arduino card and to implement the App

**App
mySIM-E**

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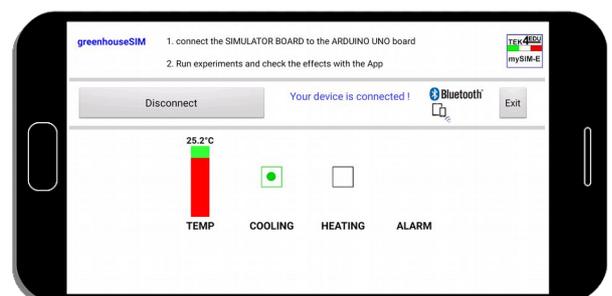
COURSE PROGRAM
- Installation of the simulator by placing the Arduino UNO board, the electronic board and the Bluetooth module
- Reading of electrical diagram attached, identification of electronic components supplied and mounted on the electronic board
- Check that the circuit is made consistent with the electrical diagram
- Connecting the Arduino UNO board to the PC with the USB cable and start the PC
- Installing the **Arduino Software IDE** and opening the file that contains the **included code** (**Sketch**)
- Installing the **included Android App** (file **.apk**), pairing the simulator with the mobile device and launching the App
- Selection of input commands (potentiometer, switch) and observation of the unit state by the output (leds, buzzer)
- Analysis of the operating logic of the simulator
- Code analysis to observe the similarities between the operating logic of the simulator and the development of the code itself: it is supplied the **flow- chart** of the code
- Changing the code, upload from PC to Arduino UNO board and verification of the effects
- Description of how to build a simulator-compatible **Android app** using a free downloadable app from **Google Play**
- Analysis of the proprietary **Android app included** (file source **.aia** for **MIT App Inventor 2** development environment) that allows the receipt and viewing of data sent by the simulator to the **Android device (not included)** using **Bluetooth** technology

TECHNICAL SPECIFICATIONS
The Block diagram contains the following components:
- Sun, evaporative panel, collecting pipe, pump, distribution pipe, extractor fan, heater, fan jet, jet tube, circulation fan, thermometer, hygrometer, automation and control equipment

Nr.1 Arduino UNO board
Nr.1 electronic board which includes electronic components and Bluetooth module
Electronic components:
- leds, buzzer, potentiometer, resistors, switches
Wiring: flexible jumper cable, mix color and length, male to male
User controls:
- solar irradiation: continuously adjustable
- humidity: normal, excessive
Light indicators:
- temperature: high, normal, low
- pump of cooling system: on, off
- heater: on, off
- extractor fan: on, off
- circulation fan: on, off
Sound indicator:
- alarm: excessive humidity
Simulator is ready-to-use:
- Arduino UNO board is already programmed with its code
- electronic board already assembled with electronic components
- the App is already ready to be used
Accessories included:
- Student manual: contains exercises that describe how to use the unit, the code (sketch) and the proprietary App
- USB cable
- proprietary Android App
Power supply:
- by USB port of Arduino UNO board connected to a **Personal Computer or Power bank (not included)**
- by external power supply **(not included, option suggested T4E-ACC-03)**
Dimensions and weight:
- 310x210x70 mm
- Total weight: 1kg

source file .**aia** (included) of the **mySIM-E App** developed with **AI2** (sections **Designer** and **Blocks**)

App developed with free application downloadable from **Google Play**

Option:
- 12V PS ADAPTER mod.T4E-ACC-03

Accessories included:
- Student manual
- USB cable
- proprietary Android App

Accessories not included:
- Computer
- Android Device