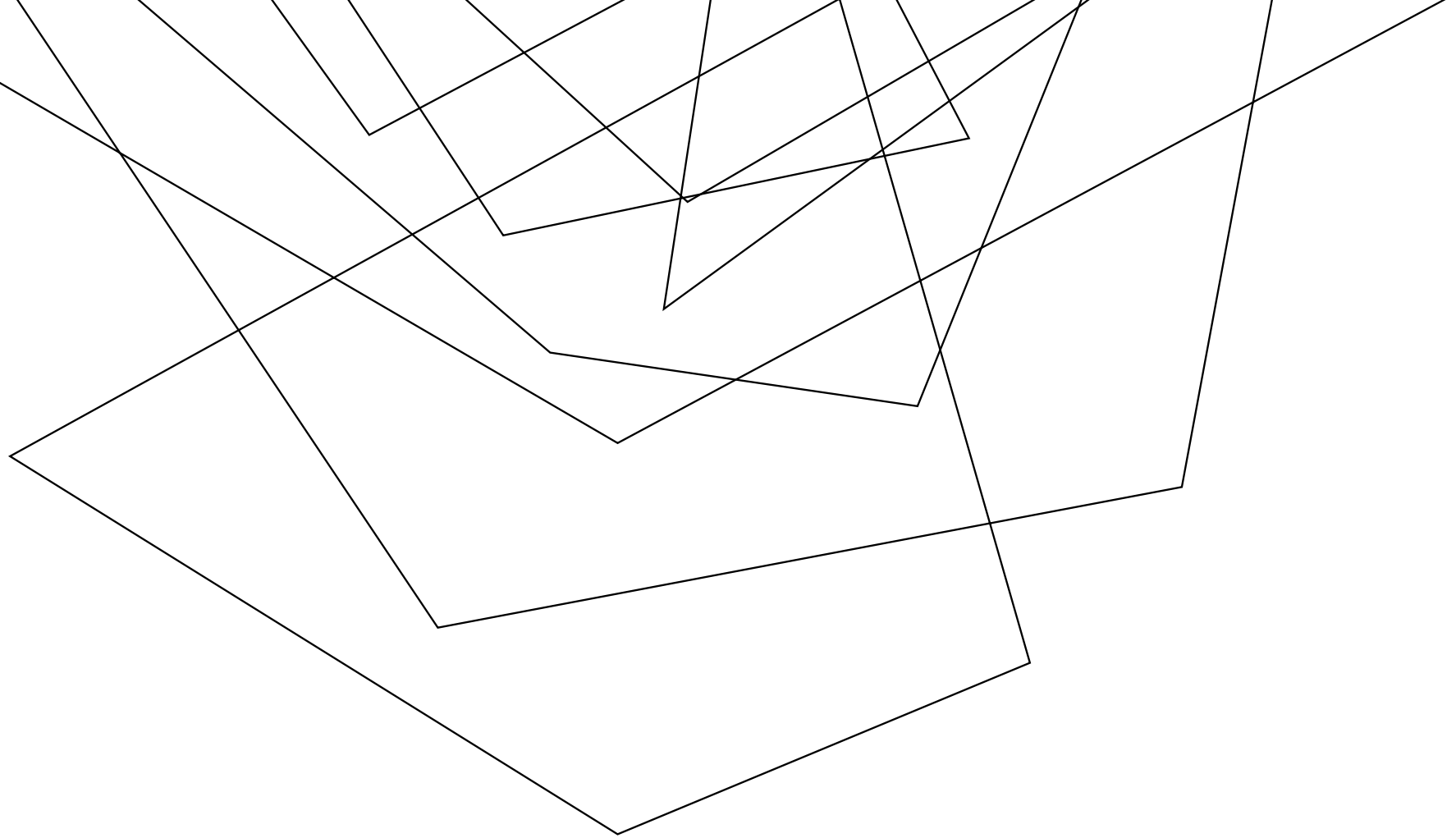


SMART FARMING FOR A SUSTAINABLE FUTURE: AUTOMATING HYDROPONICS

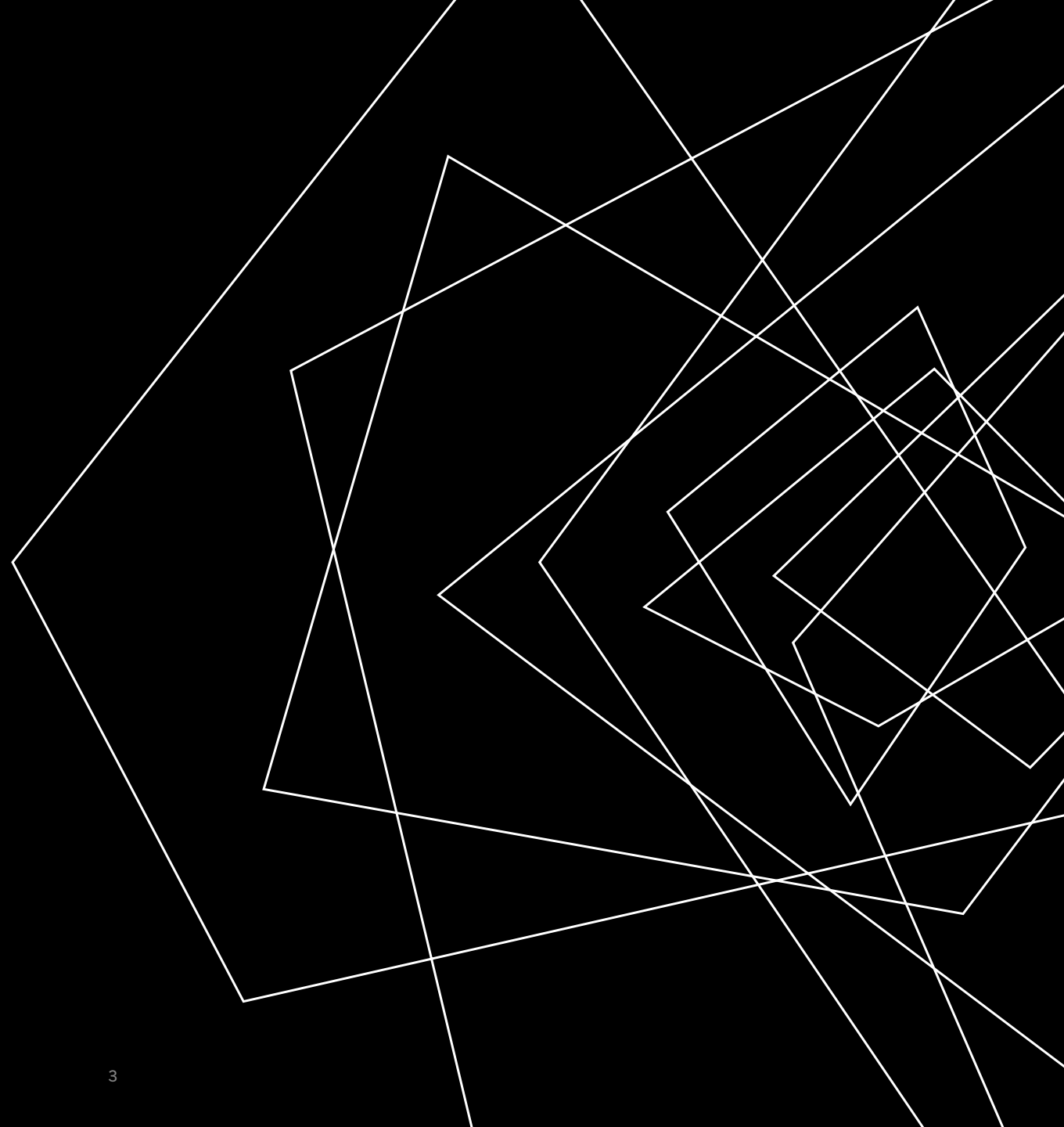
Elian Ulrich -Marcos Zorn

Universidad Tecnológica Nacional
Facultad Regional Paraná

Electronics Engineering Department, Inglés II

2023

INTRODUCTION



INTRODUCTION

AUTOMATED HYDROPONICS

Automated hydroponics, a soilless vertical agriculture technique using water-based nutrient solutions, offers a sustainable and efficient approach to farming.

SUSTAINABLE DEVELOPMENT GOALS

The SDGs are 17 global objectives.

TARGETS OF THE SDGS REFERENCED IN THIS PRESENTATION

N° 12 Sustainable Consumption

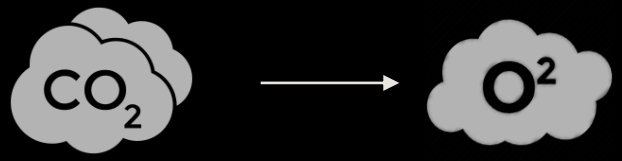
12.1 To implement resilient agricultural practices

N° 2 World Hunger

2.4 To achieve sustainable consumption in the near future

PLANTS AND SOILS

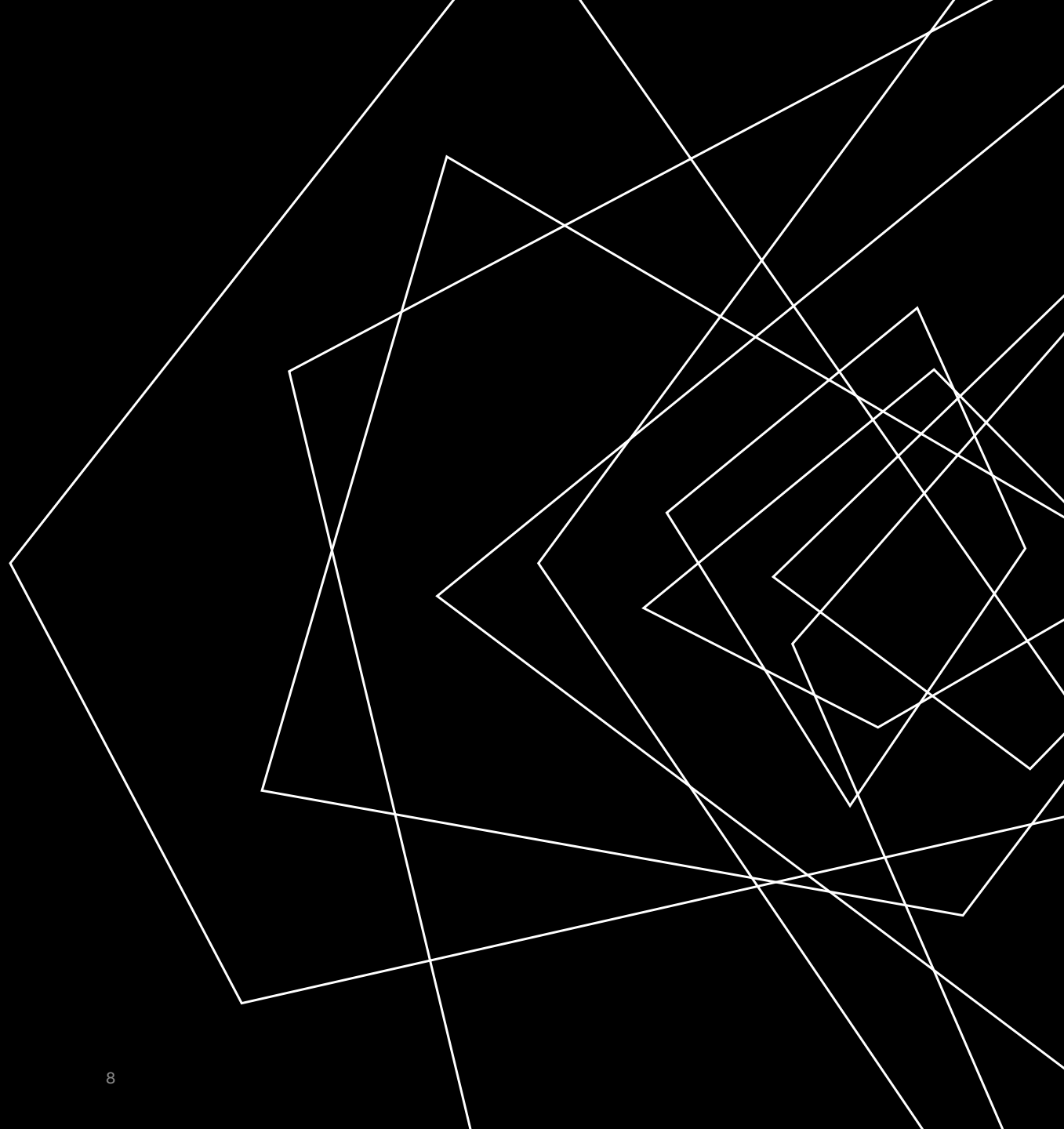
Vital role of plants

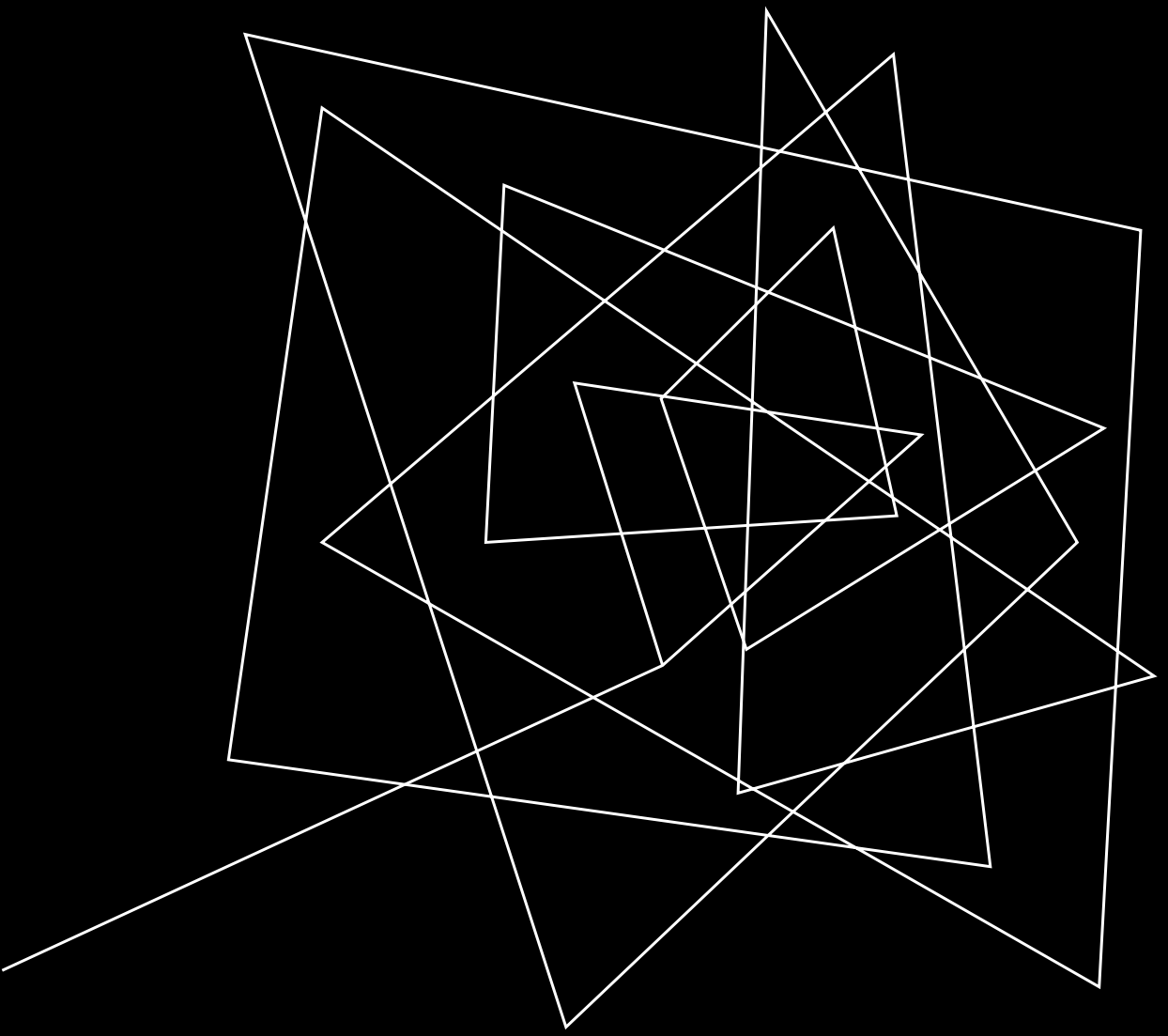


Different soils

WORK PURPOSE

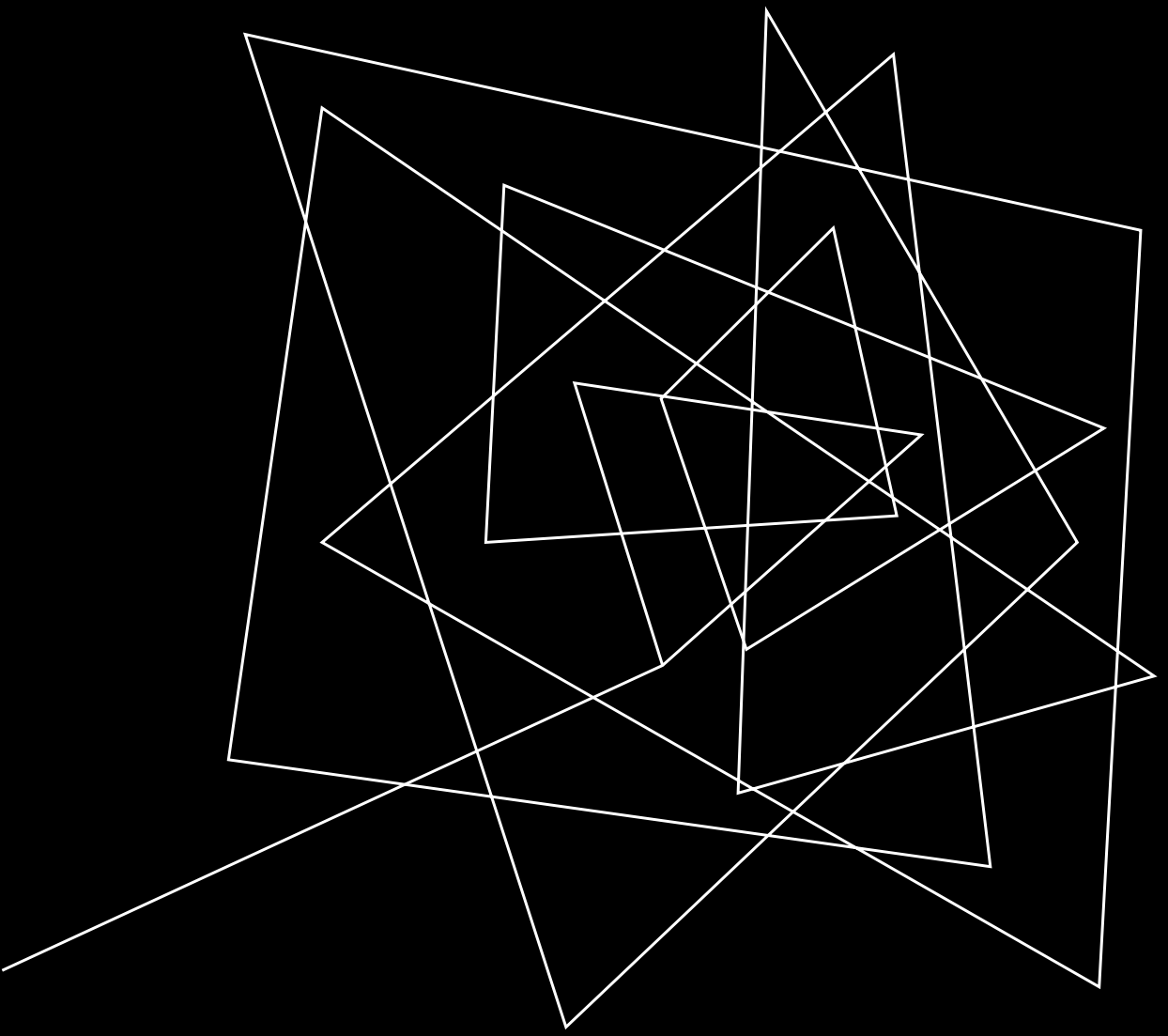
To highlight the significant promise of automated hydroponics for a more sustainable, efficient, and resilient future of agriculture in Argentinian sterile soils





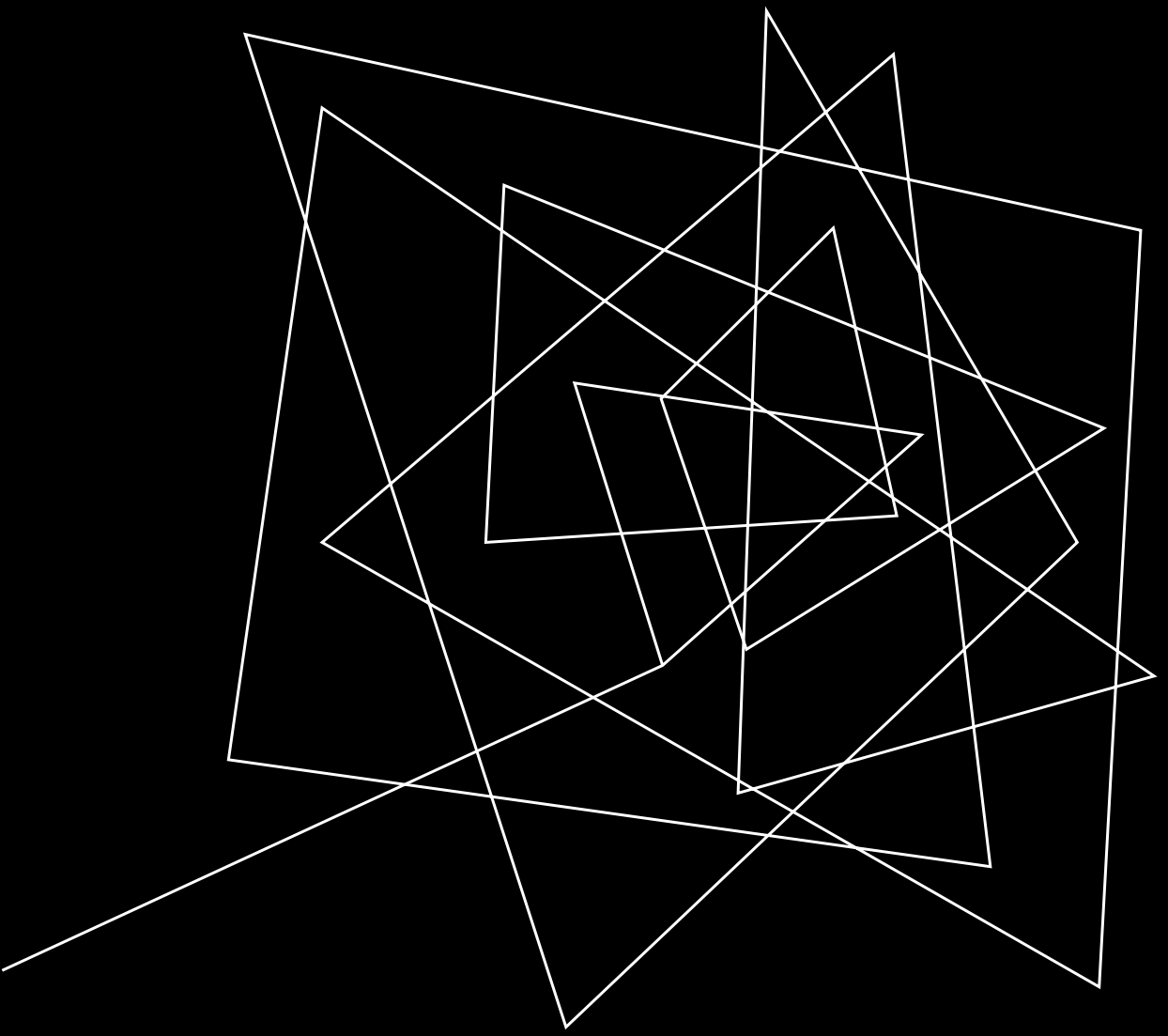
MAP OF THE PRESENATION

- Description of the problem
- Electronic components used for automating hydroponics
- The automation process



EXPECTED WORK IMPACT

To highlight the potential impact of hydroponics to address the limitations faced by traditional farming in challenging soils worldwide



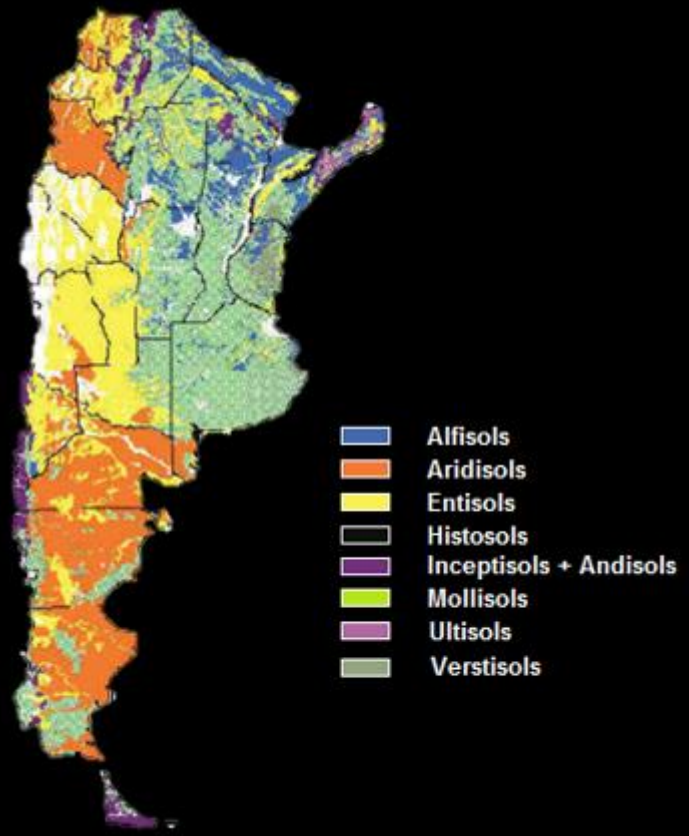
PROBLEM DESCRIPTION

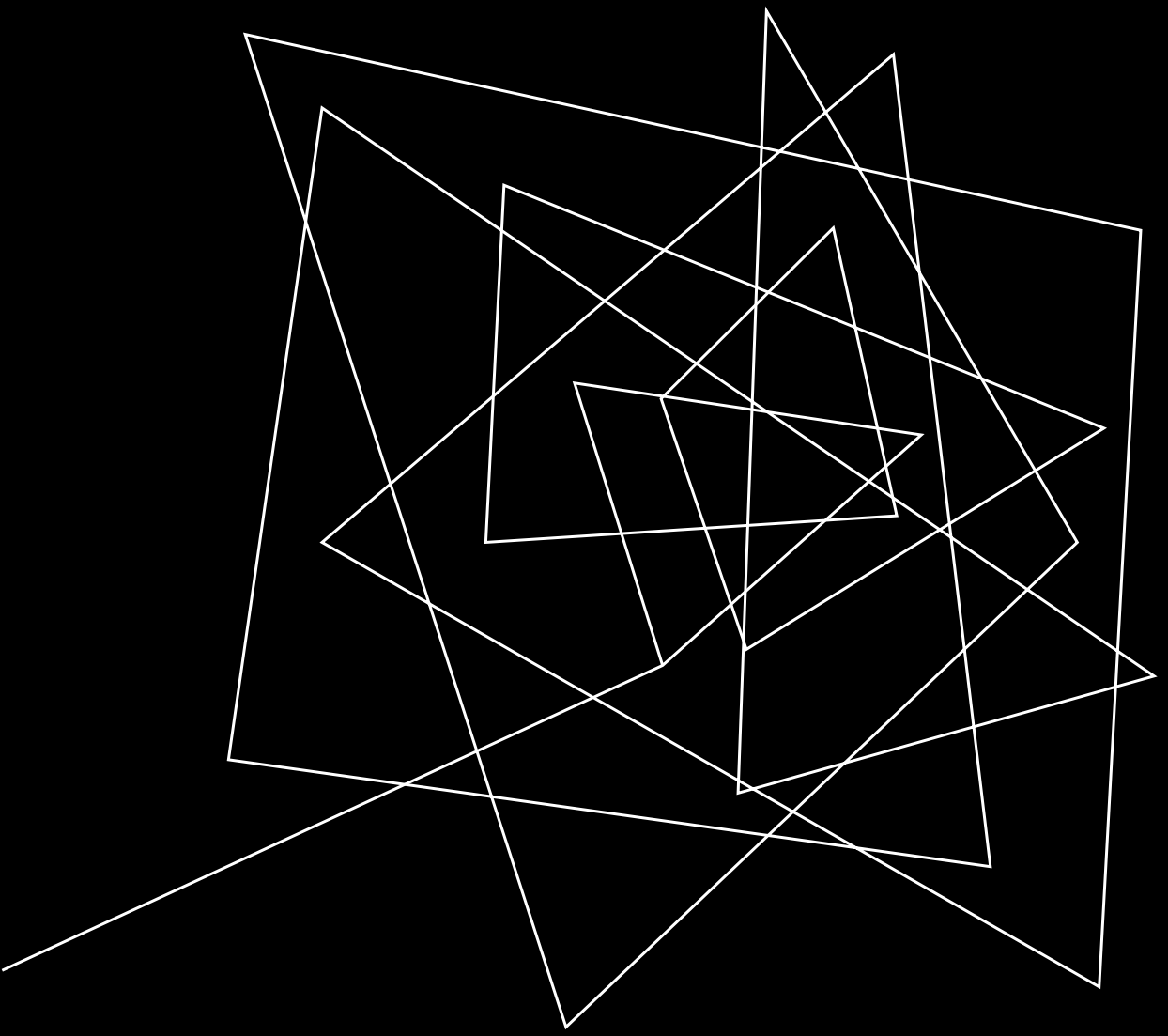
PROBLEM DESCRIPTION

SOIL SITUATION IN ARGENTINA

PROBLEM DESCRIPTION

DOMINANT SOILS IN ARGENTINA





AUTOMATED HYDROPONICS SYSTEM DESIGN

AUTOMATED HYDROPONICS SYSTEM DESIGN

IMPLEMENTING HYDROPONICS: SETTING UP

AUTOMATED HYDROPONICS SYSTEM DESIGN

IMPLEMENTING HYDROPONICS: PERFECT VEGETABLES

Lettuce

Basil

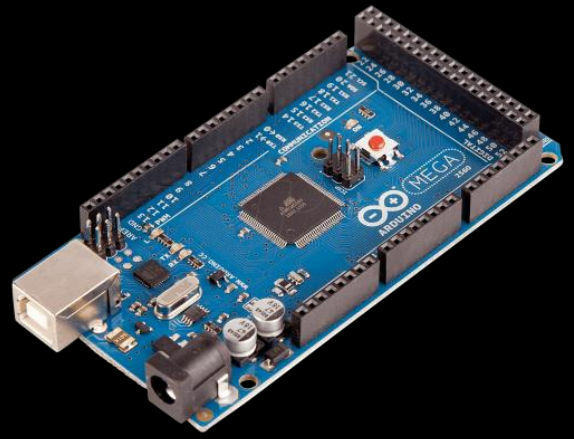
Arugula

Tomato

SYSTEM DESIGN

ARDUINO BOARDS

Cheap and open-source electronic boards based on easy-to-use software



Arduino Mega R2

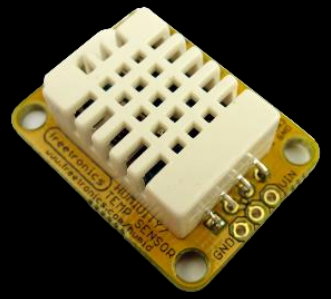
Arduino Uno R2

Arduino Nano R2

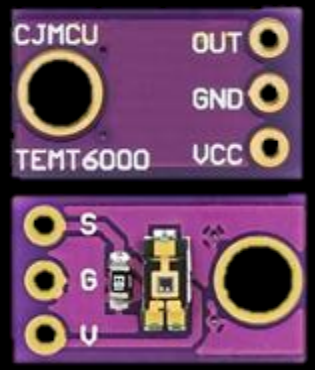
SYSTEM DESIGN

SENSORS

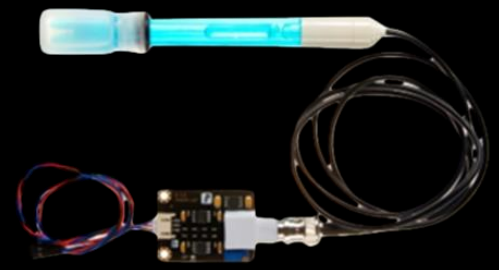
These are able to be linked to a wide array electronic sensors making them extremely useful.



DTH11 humidity and temperature sensor



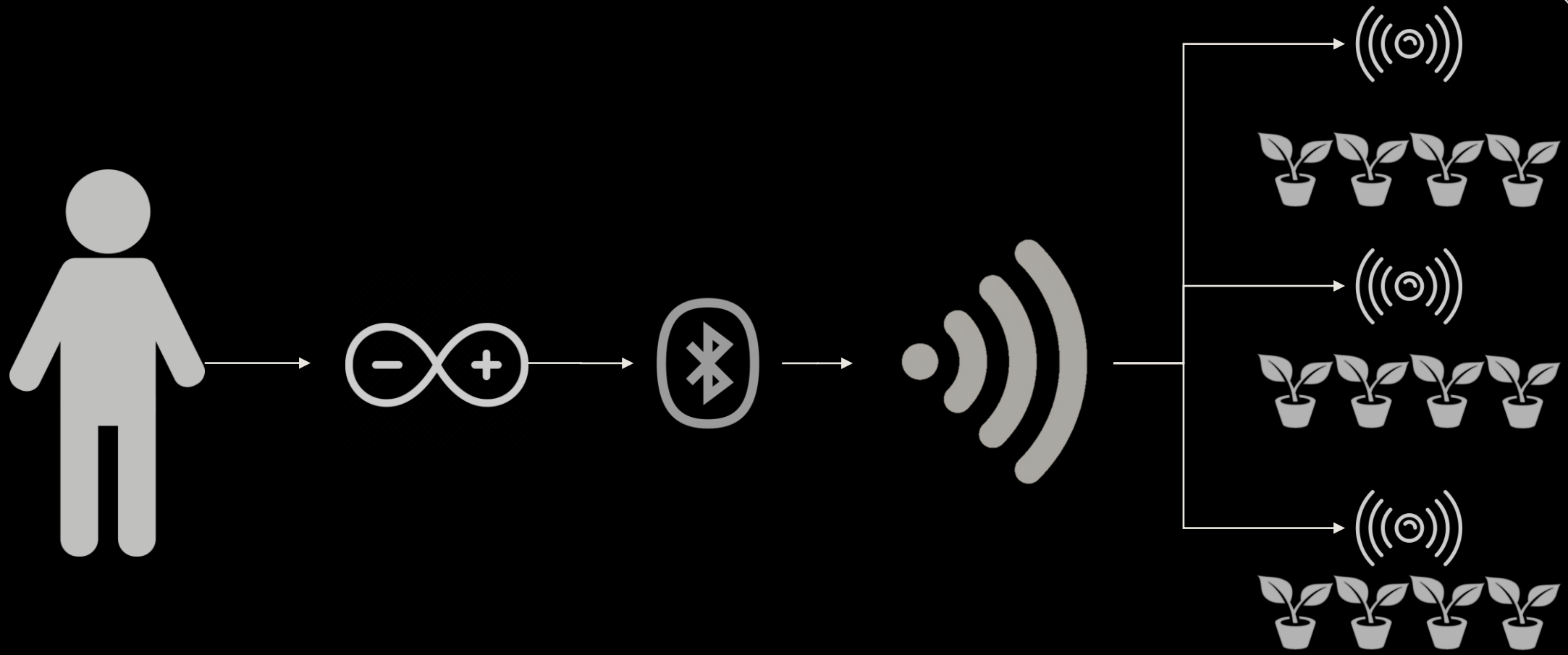
TEMT6000 light intensity sensor



SEN0161 pH sensor

SYSTEM DESIGN

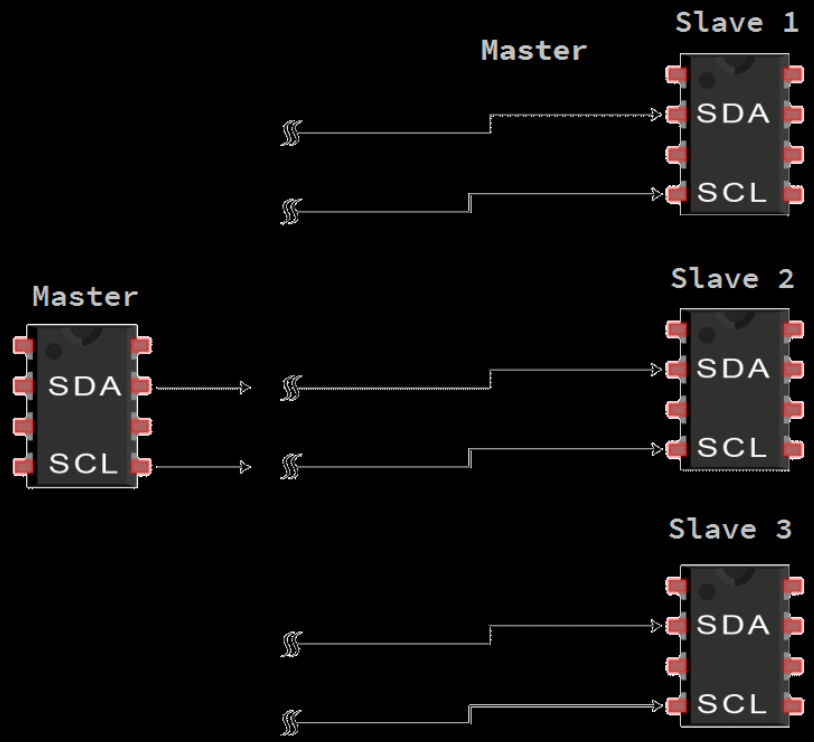
BLUETOOTH AND COMMUNICATION PROTOCOL



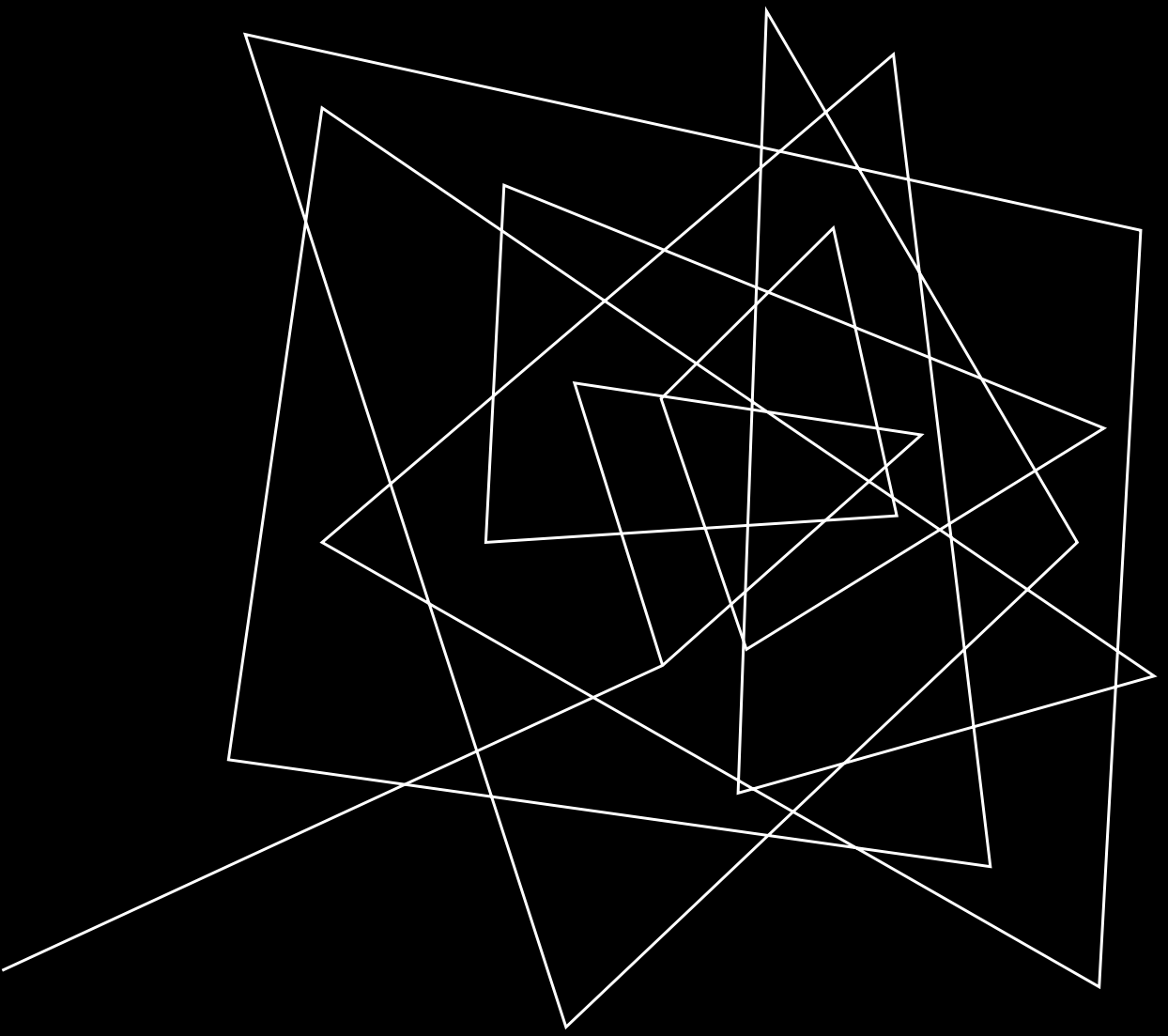
SYSTEM DESIGN

BLUETOOTH AND COMMUNICATION PROTOCOL

Bluetooth Module HC-06



Communication Protocol I2C

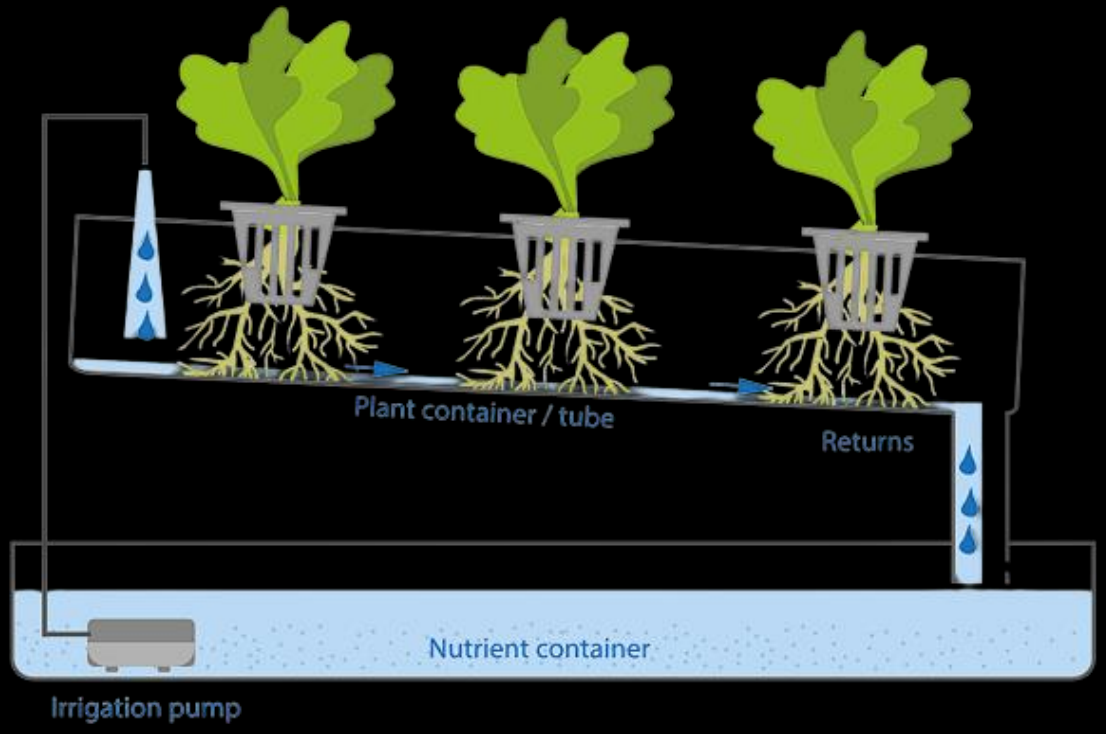


CULTIVATION TECHNIQUE AND AUTOMATION

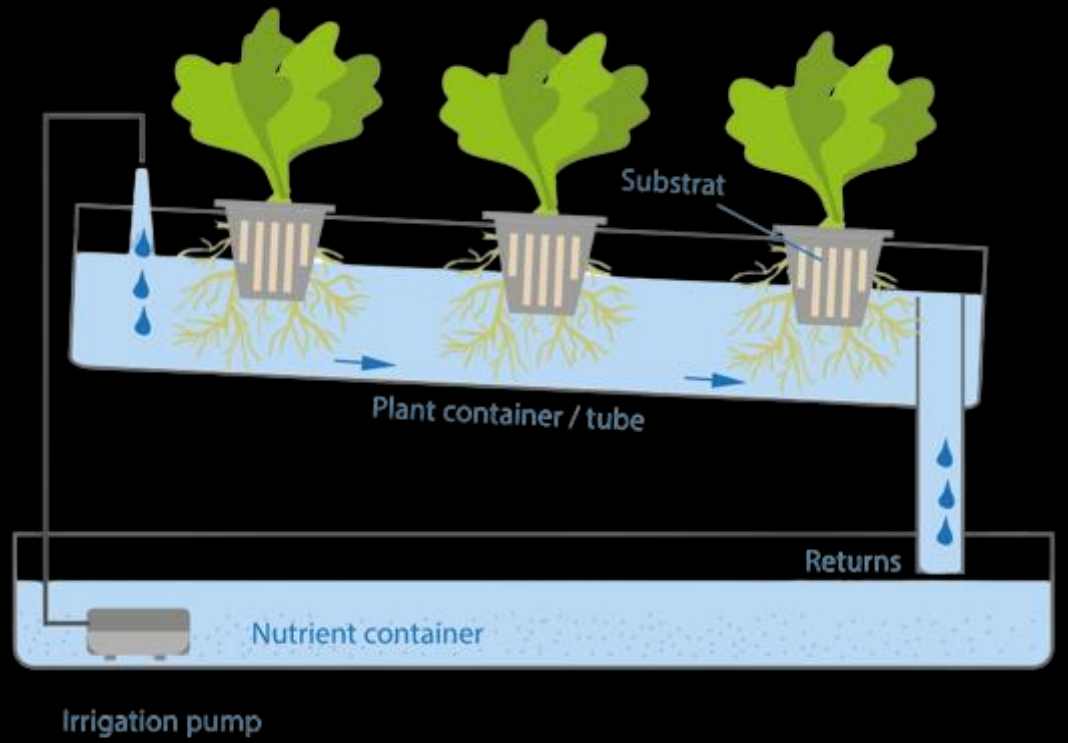
CULTIVATION TECHNIQUE AND AUTOMATION

AUTOMATION

Hydroponics system technique



Nutrient Film Technique (NFT)



Deep Flow Technique (DFT)

CONCLUSION

THANK YOU FOR YOUR TIME

Ulrich Elian

elianulrich@alu.frp.utn.com

Zorn Marcos

marcoszorn@alu.frp.utn.com

References

1. C. Boylan, "The Future of Farming: Hydroponics," Princeton Student Climate Initiative, [Online]. Available: https://psci.princeton.edu/tips/2020/11/9/the-future-of-farming-hydroponics. [Accessed 29 06 2023].
2. U. N. D. Programme, "undp.org," [Online]. Available: https://www.undp.org/sustainable-development-goals. [Accessed Jun. 29, 2023].
3. Food Agriculture Organization of the United Nations, "www.fao.org," [Online]. Available: https://www.fao.org/3/CA3121EN/ca3121en.pdf. [Accessed Jun. 29, 2023].
4. «Greentumble,» 23 11 2016. [En línea]. Available: https://greentumble.com/how-do-plants-help-the-environment. [Accessed: Jun. 29, 2023].
5. G. WU, "5 Hydroponic Systems With Raspberry Pi and Arduino," 13 03 2022. [Online]. Available: https://psci.princeton.edu/tips/2020/11/9/the-future-of-farming-hydroponics. [Accessed Jun. 29, 2023]
6. G. Moscatelli y M. S. Pazos, «Soils of Argentina - Nature and Use,» 22 04 2000. [En línea]. Available: https://edepot.wur.nl/484598. [Accessed: Jul. 01, 2023]
7. "Natural Resources Conservation Service" [Online]. Available: https://www.nrcs.usda.gov/sites/default/files/2022-06/Illustrated_Guide_to_Soil_Taxonomy.pdf. [Accessed Jul. 01, 2023]
8. "Complex Trophic Interactions in Deserts: An Empirical Critique of Food-Web Theory" [Online]. Available: https://www.jstor.org/stable/2462536 [Accessed Oct. 21, 2023].
9. "Arduino, Arduino Uno, Microcontrolador PNG" [Online]. Available: https://www.gratispng.com/png-qqk907/ [Accessed Oct. 22,2023].

References

9. "DHT11 Humidity & Temperature Sensor" [Online]. Available: https://www.mouser.com/datasheet/2/758/DHT11-Technical-Data-Sheet-Translated-Version-1143054.pdf [Accessed Oct. 22,2023].
10. "TEMT6000 Ambient Light Sensor & Arduino – Measure Illuminance & Light Intensity" [Online]. Available: https://how2electronics.com/temt6000-ambient-light-sensor-arduino-measure-light-intensity/ [Accessed Oct. 22,2023].
11. "SEN0161 PH meter" [Online]. Available: https://wiki.dfrobot.com/PH_meter_SKU__SEN0161_ [Accessed Oct. 22,2023].
12. "HC-06 Bluetooth Module" [Online]. Available: https://components101.com/wireless/hc-06-bluetooth-module-pinout-datasheet/ [Accessed Oct. 22,2023].
13. "UM10204 I2C-bus specification and user manual" [Online]. Available: https://www.nxp.com/docs/en/user-guide/UM10204.pdf [Accessed Oct. 22,2023].
14. "BASICS OF THE I2C COMMUNICATION PROTOCOL" [Online]. Available: https://www.circuitbasics.com/basics-of-the-i2c-communication-protocol/ [Accessed Oct. 22,2023].
15. "Automation of a hydroponic system" [Online]. Available: https://www.researchgate.net/publication/358637200_Automation_of_a_hydroponic_system [Accessed Nov. 11, 2023].
16. "Various hydroponics systems" [Online]. Available: https://www.hydroponic-urban-gardening.com/rubriken/various-hydroponics-systems/ [Accessed Nov. 11, 2023].

SMART FARMING FOR A SUSTAINABLE FUTURE: AUTOMATING HYDROPONICS

Elian Ulrich-Marcos Zorn

Universidad Tecnológica Nacional
Facultad Regional Paraná

Electronics Engineering Department, Inglés II

2023