



Title: Adjustable testbench system to stretch optical fiber

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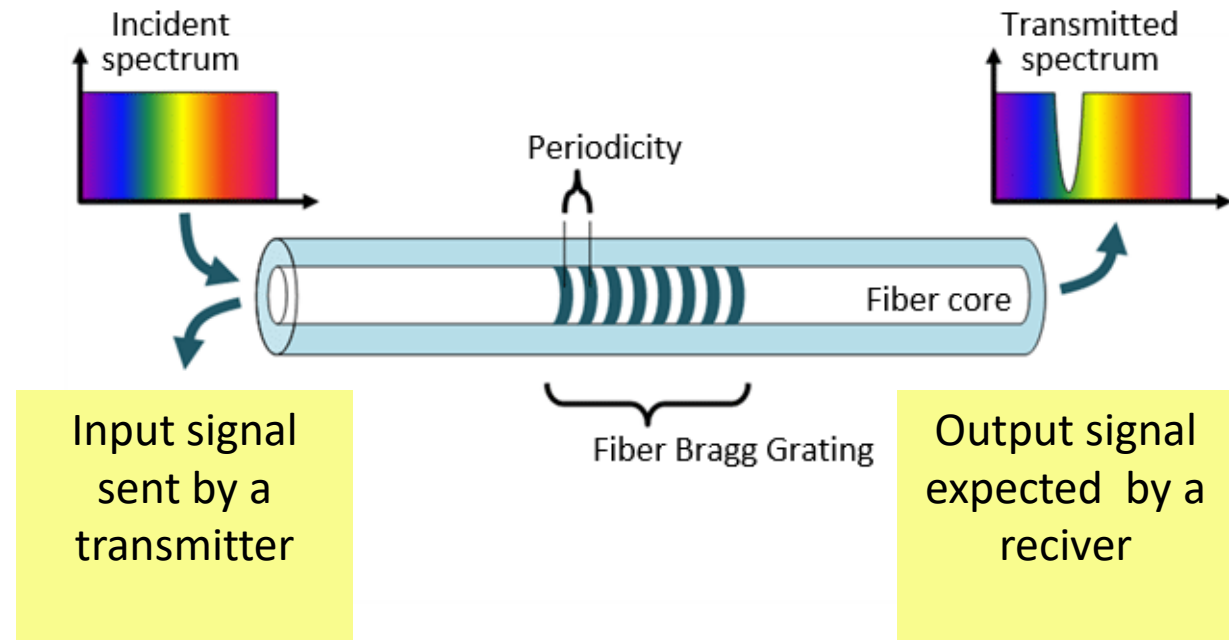
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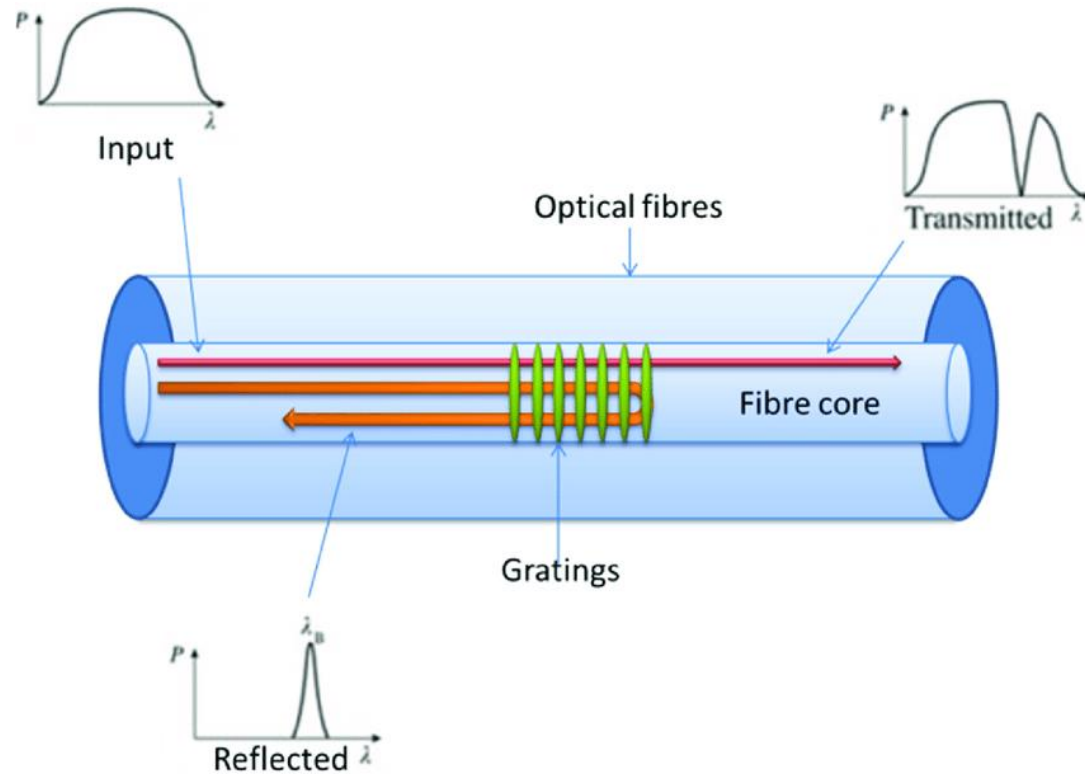
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Introduction

Optical fiber filaments



Introduction

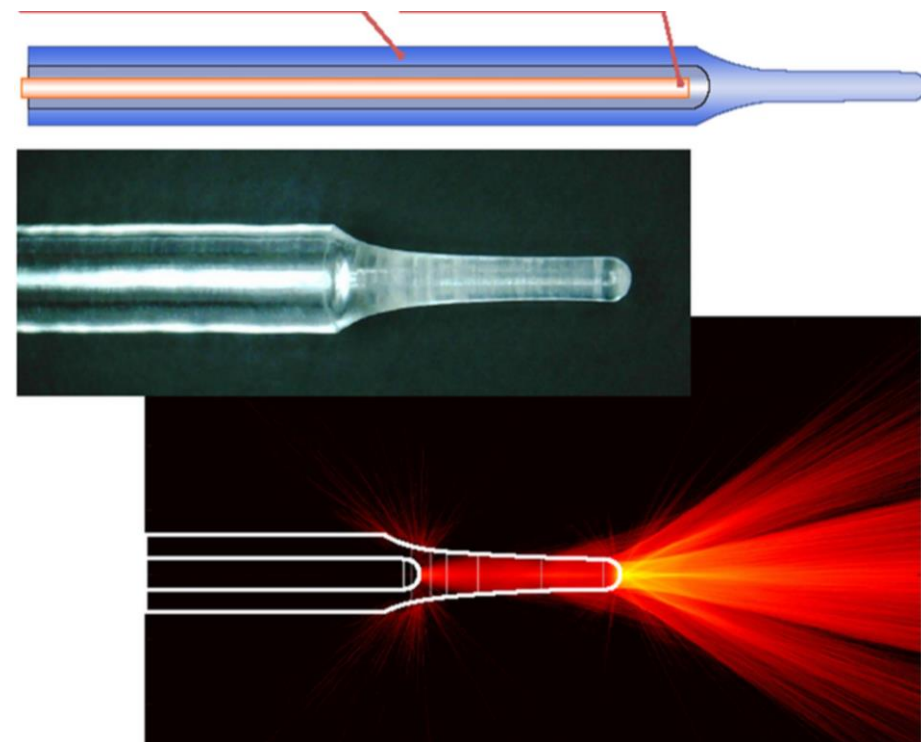
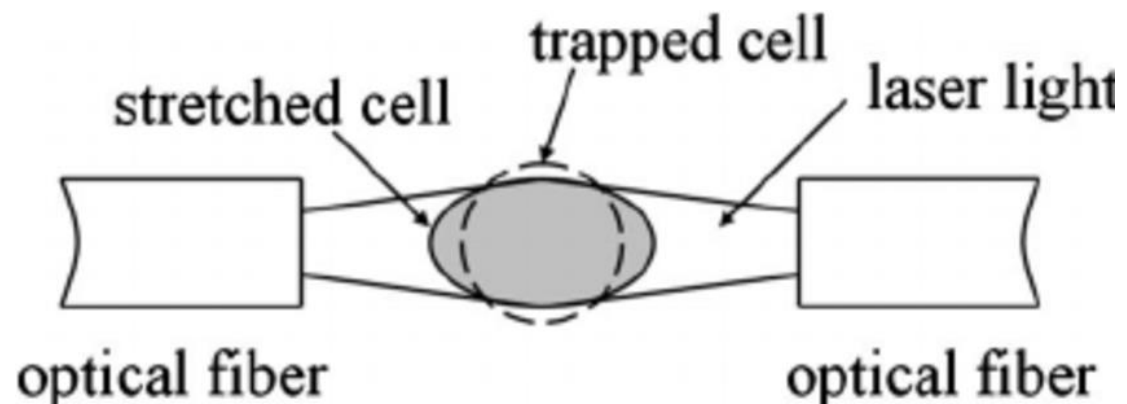


Applications

- Concrete structures deformation
- Sense human body fluids
- Temperature detection

Introduction

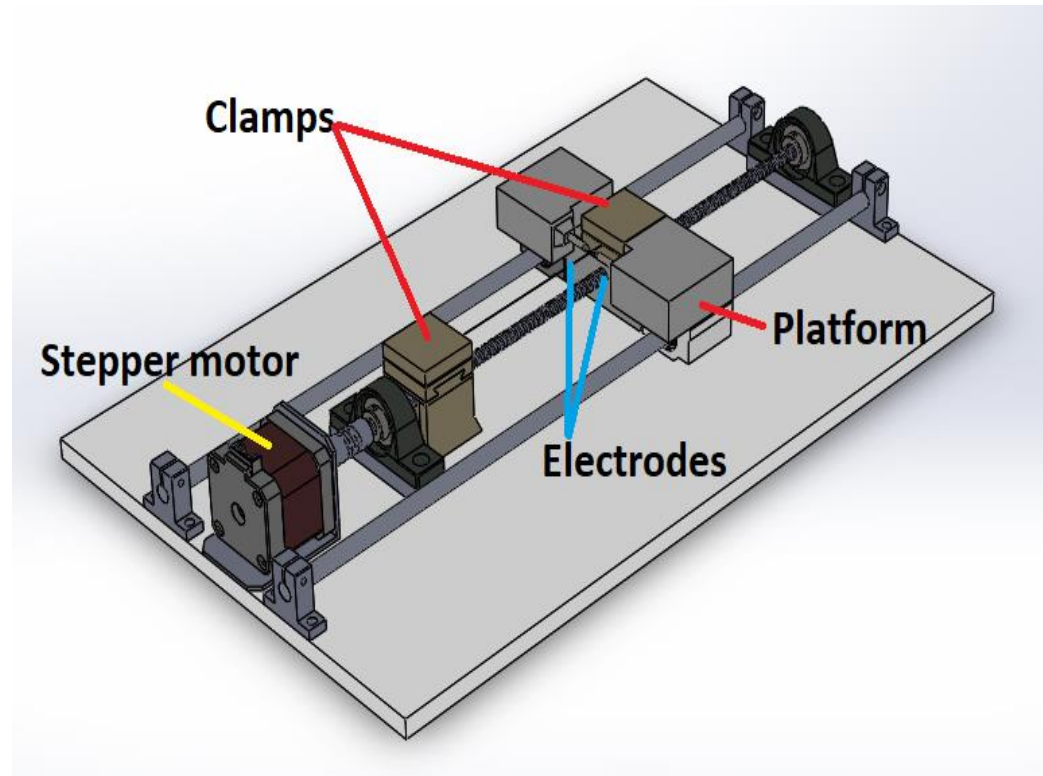
Stretching optical fiber filaments



Effects on the stretched fiber

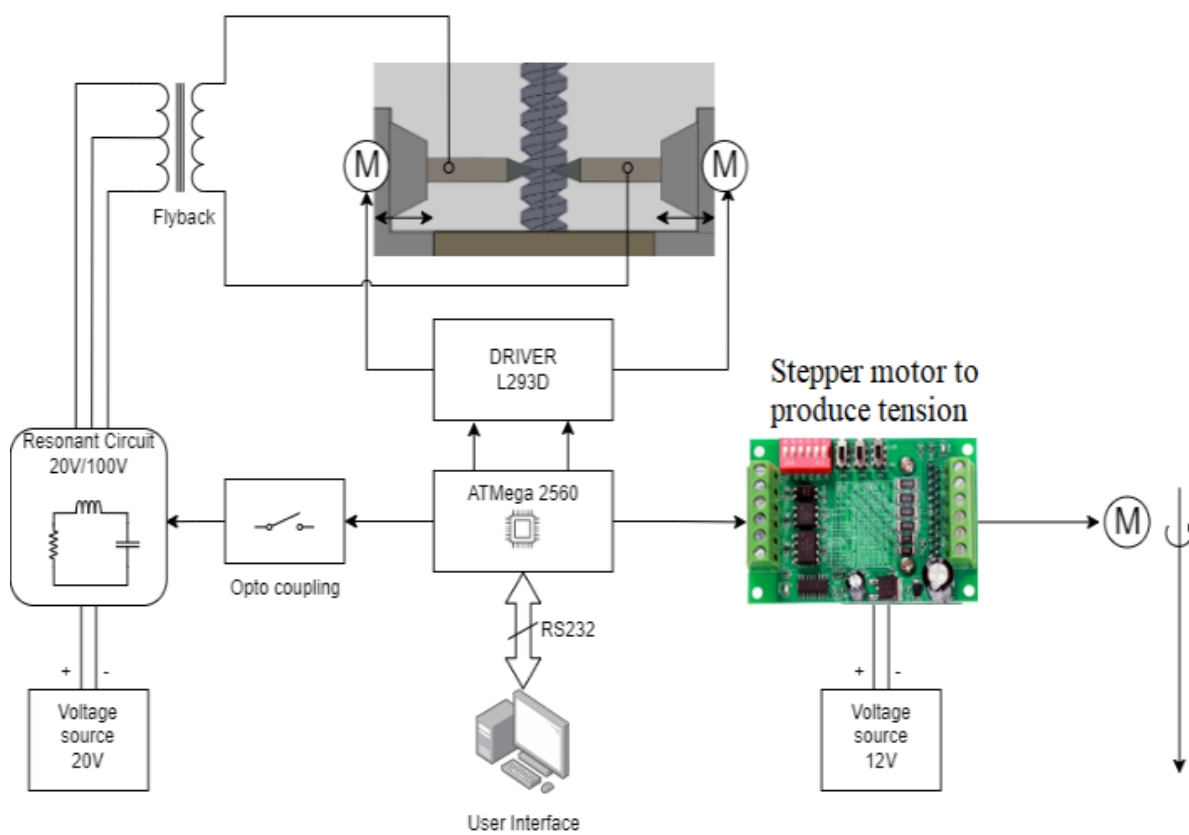
Introduction

Backgroun of a stretching
machine function

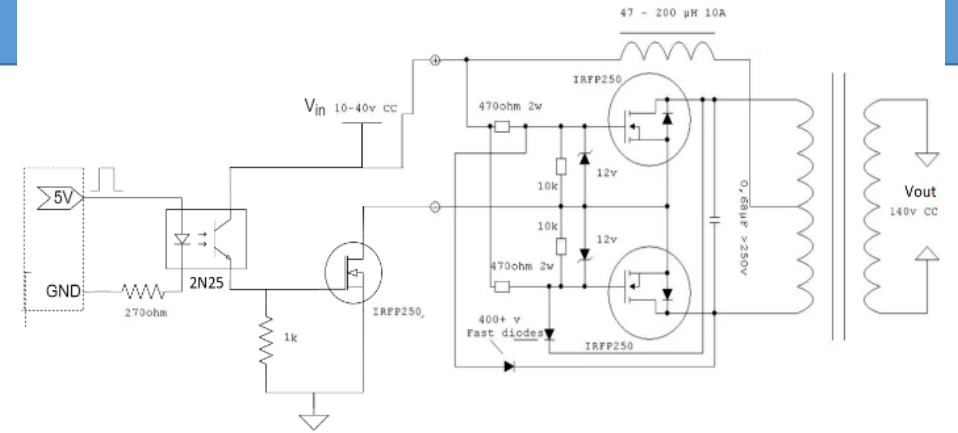


Methodology

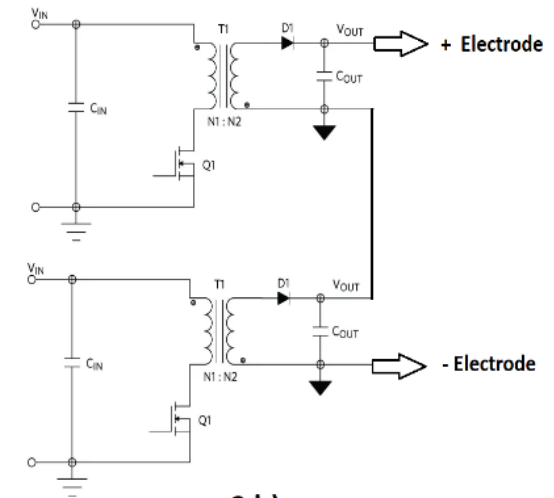
Developed system



General block Diagram with the system stages



2 a)

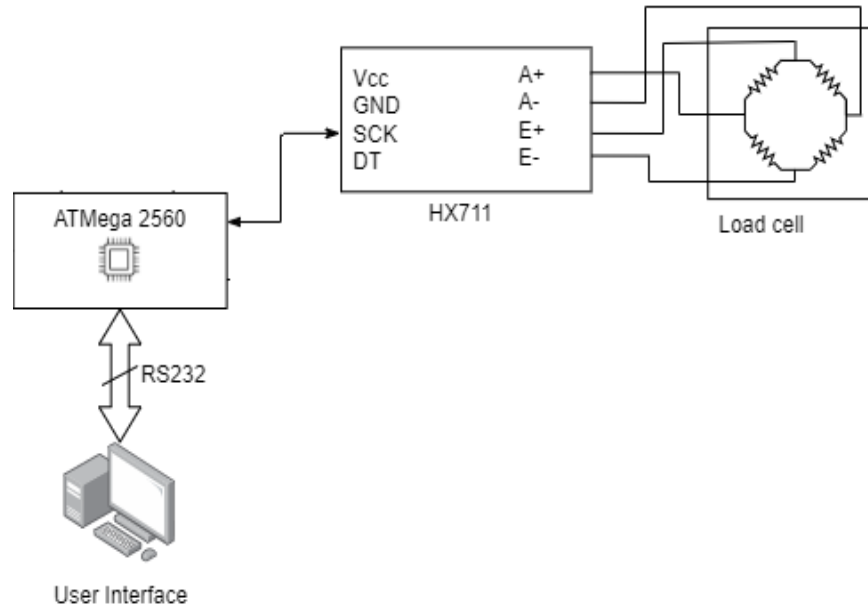


2 b)

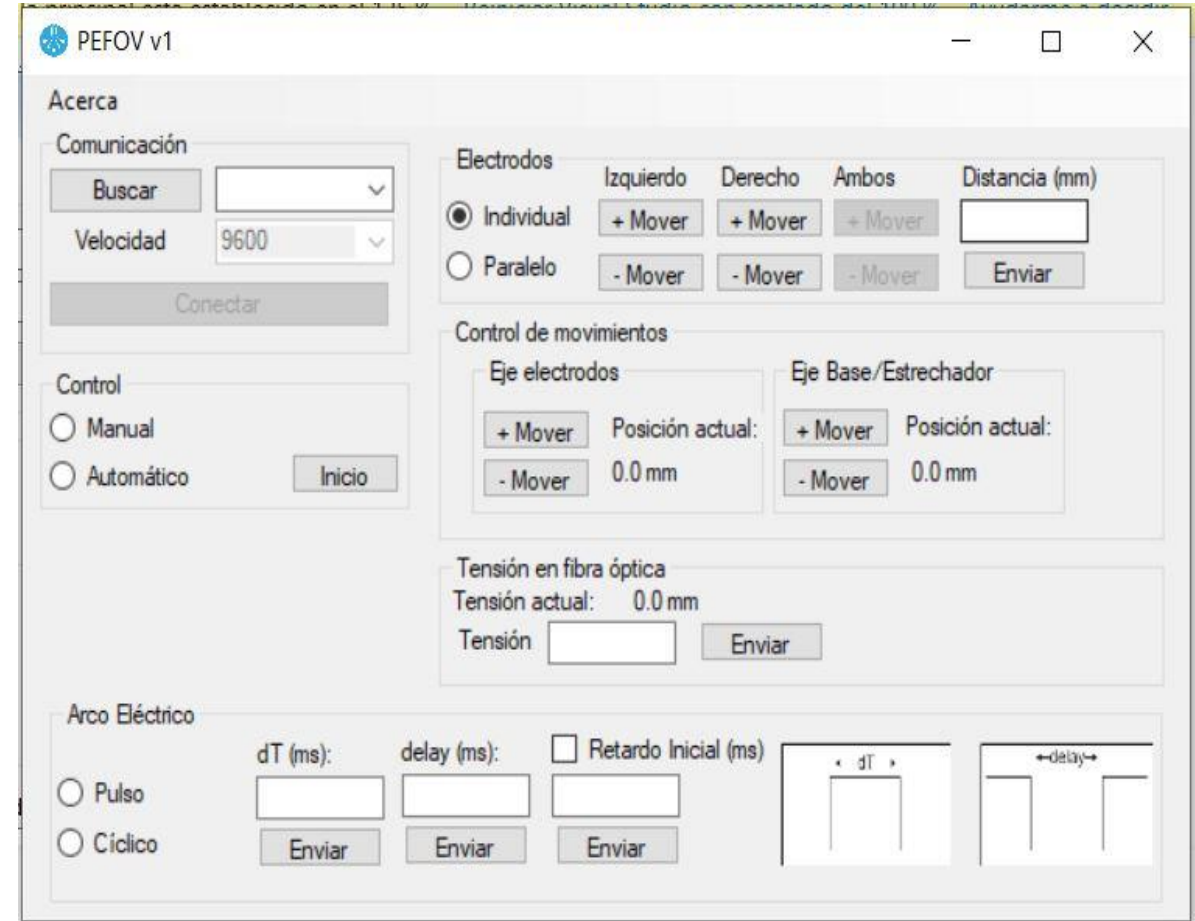
Schematic Diagram, a) circuit to drive each fly-back converter, b) Two converts series-connected

Methodology

Developed system



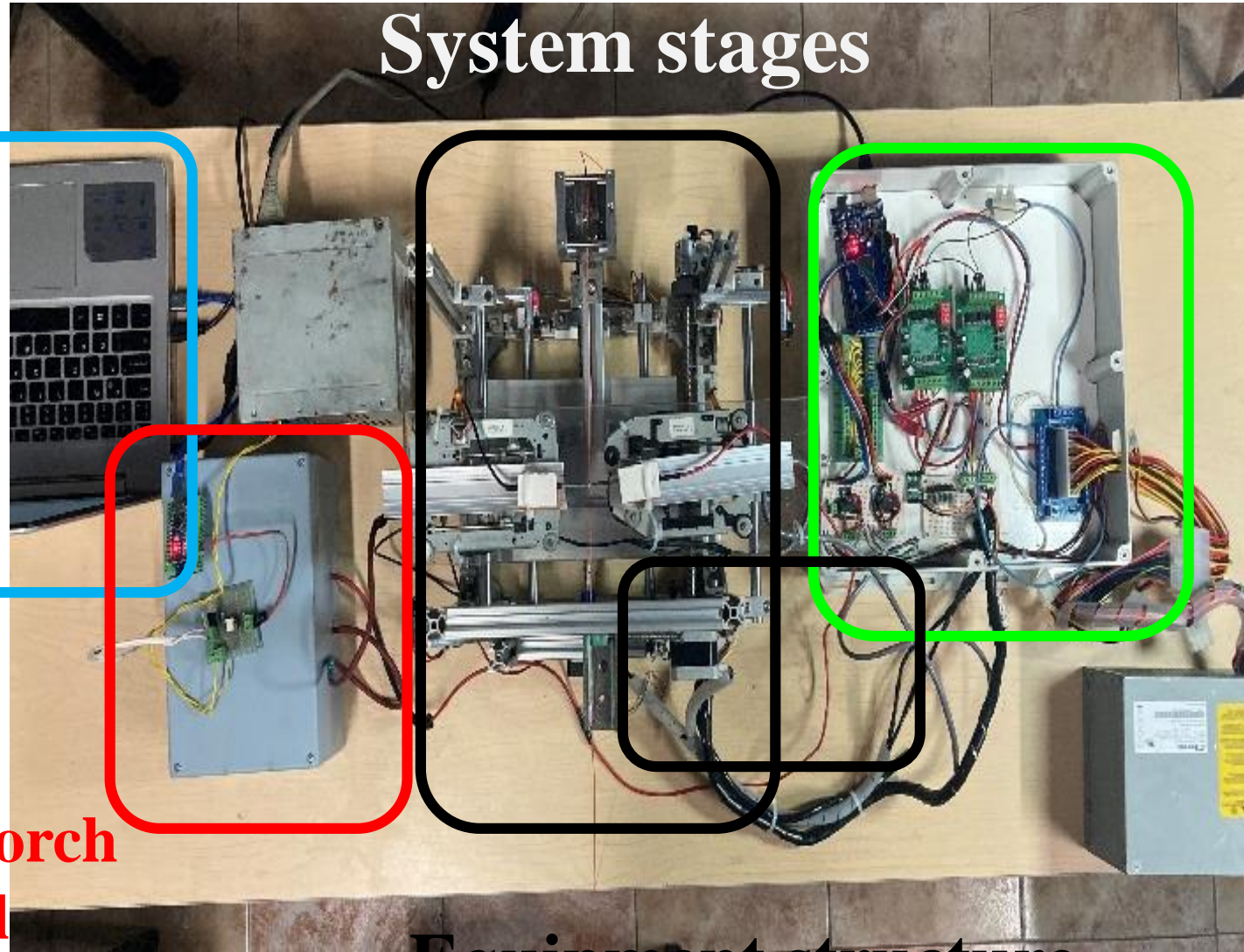
Strain gauge connection



HMI on the computer

Results

System
Interface on
a computer

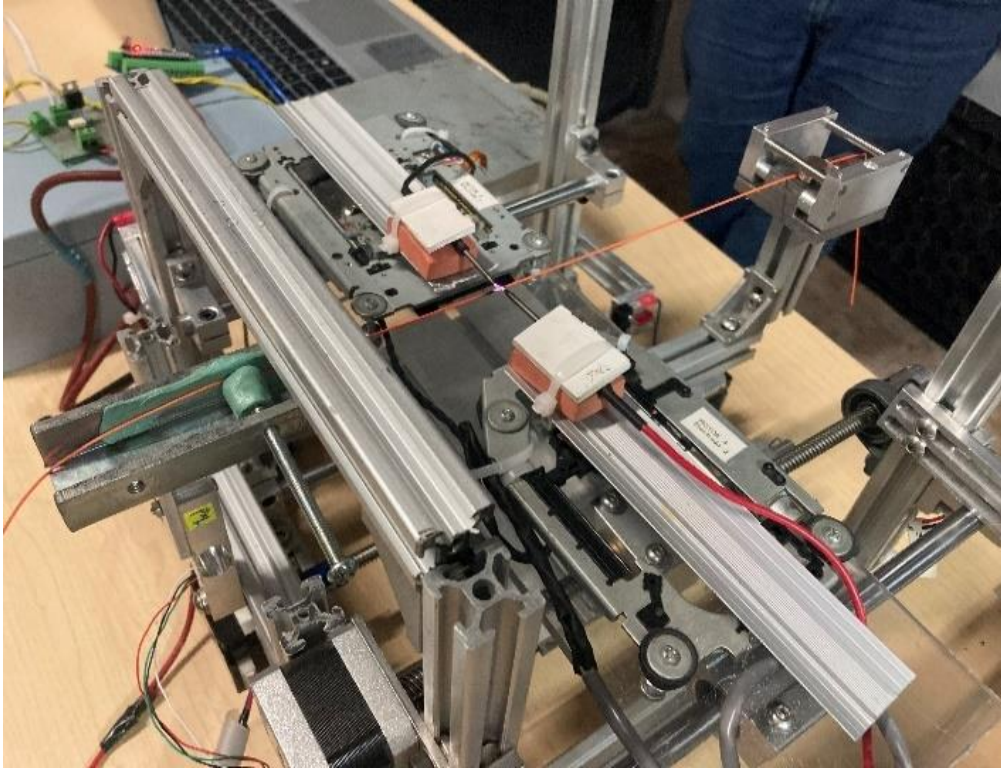


Control system
for XY-Table

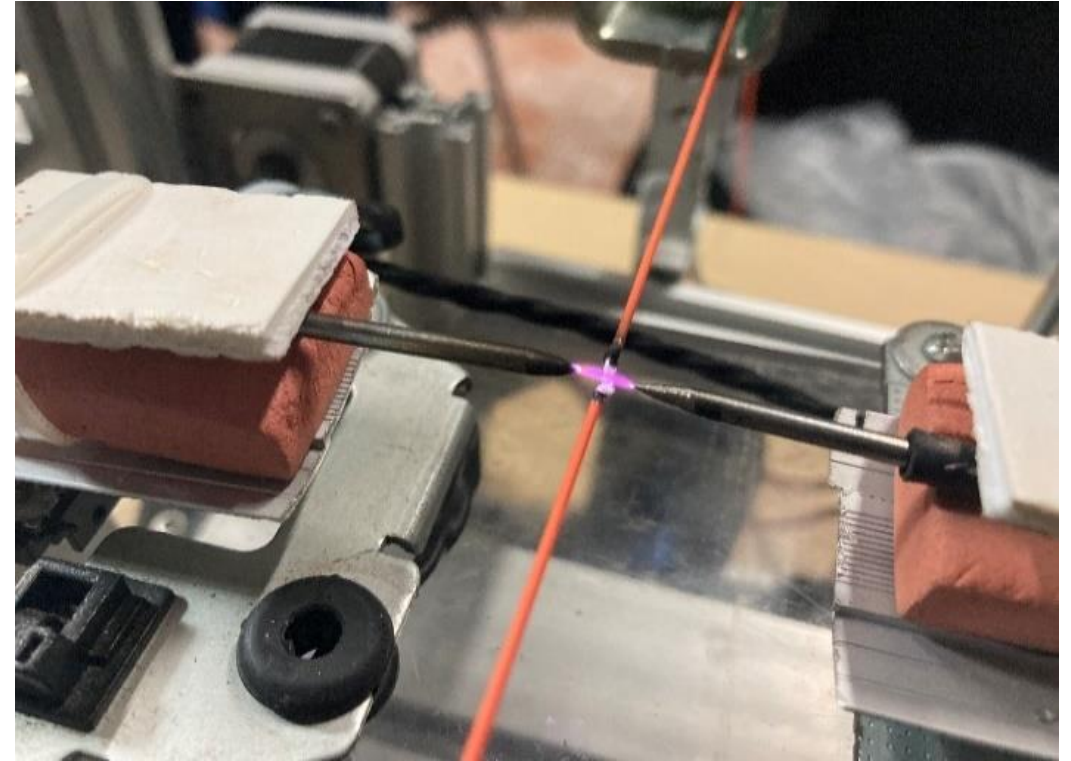
Stage for torch
control

Equipment structure

Results



Stretching platform in operation



Close up to the electric arc

Results

Several tests took place on the system stretching, the GOF was espoused to a tension of 0.9 newtons, and the GOF had an elongation of 0.5 mm with pulsing intervals of 2 seconds on and 3 seconds off for 15 seconds.

The platform has proved its effectiveness, modularity and functioning. The GOF got stretched and parameters can be adjusted as needed by user.

Conclusions

- A robust system was built to produce electric arcs strong enough to heat up GOF at the point to stretch them.
- An electric circuit was developed with a software and a HMI to control periods for the electric arc and the tension applied to the optical fiber.
- The system is modular and open architecture to be able to incorporate more stages and add other parameters for more integrated tests.
- With this prototype, it is expected to start new researches on medical, construction and environmental sensors.

References

- L. Shan, G. Pauliat, G. Vienne, L. Tong y S. Lebrun, "Design of nanofibers for efficient simulated Raman scattering in the evanescent field", J. Europ. Opt. Soc. Rap. Public. 8, 13030 (2013). DOI: 10.2971/jeos.2013.13030
- N. A. Razak, B. A. Hamida, N. Irawati and M. H. Habaebi, "Technique and coated with Polymer Polyaniline for Sensing Application". International Technical Postgraduate Conference. Series: Materials Science and Engineering 210 (2017). DOI:10.1088/1757-899X/210/1/012041
- Jalil Jafari and Rahman Nouroozi, "Fabrication and Characterization of the Fiber Optical Taper for a Surface Plasmon Resonance Sensor", International Journal of Optics and Photonics, Vol 11, No. 1, Winter-Spring, 2017. DOI:10.18869/acadpub.ijop.11.1.19
- Caibin Yu, Xiaoxiao Chen, Yuan Gong, Yu Wu, Yunjiang Rao and Gangding Peng, "Simultaneous Force and Temperature Measurement Using Optical Microfiber Asymmetrical Interferometer", Photonic Sensors, Vol. 4, No. 3, 2014, pp. 242-247. DOI:10.1007/s13320-014-0201-4
- K. S. Lim, S. W. Harun, H. Arof and H Ahmad, "Fabrication and Applications of Microfiber", Selected Topics on Optical Fiber Technology", www.intechopen.com, hard cover, 668 pages, 22, February 2012. DOI: 10.5772/31123
- Donghwa Lee, Kwang Jo Lee, Jin-Hun Kim, Kyungdeuk Park, Dongjin Lee, Yoon-Ho Kim, Heedeuk Shin, "Fabrication method for ultra-long optical micro/nano-fibers", Current Applied Physics 19 (2019) 1334–1337. <https://doi.org/10.1016/j.cap.2019.08.018>
- R. Garcia-Fernandez, A. Stiebeiner, and A. Rauschenbeutel, "Optical nanofibers and spectroscopy", Applied Physics B, May 2011. <https://doi.org/10.1007/s00340-011-4730-x>
- Christian Lützler, "Fabrication of Optical Microfibers". Universit at Bonn. September 2012. DOI:10.5772/31123
- J. M. Ward, A. Maimaiti, Vu H. Le, and S. Nic Chormaic. "Optical micro-and nanofiber pulling rig". <http://dr.doi.org/10.1063/1.4901098>. Published online 24 November 2014.
- André D. Gomes and Orlando Frazao. "Microfiber Knot with Taper Interferometer for Temperature and Refractive Index Discrimination". IEEE Photonics Technology Letters, Vol. 29, No. 18, September 15, 2017. DOI: 10.1109/LPT.2017.2735185
- M. Sumetsky, Y. Dulashko and S. Chalmi. "Fabrication of miniature optical fibre and microfiber coils". Optics and Lasers in Engineering 48 (2010) 272-275. <https://doi.org/10.1016/j.optlaseng.2009.11.011>
- Liting Gai, Jin Li and Yong Zhao. "Preparation and application of microfiber resonant ring sensors: A review". Optics & Laser Technology 89 (2017) 126-136. <https://doi.org/10.1016/j.optlastec.2016.10.002>

References

- Figuroa Tabares, N. (2022). Plataforma de telemedicina con prototipo de dispositivo hardware para terapia respiratorias de EPOC y asma. <https://repository.eia.edu.co/handle/11190/5332>
- García, J. D. V., Castro, J. R., & Flóres, J. E. M. (2022). "Diseño y construcción de un robot para desinfección de superficies con luz ultravioleta". *Ingeniería: Ciencia, Tecnología e Innovación*, 9(1), 1-15. <https://doi.org/10.26495/icti.v9i1.2161>
- Sánchez Lasheras, M. J. (2022). Implementación del control de actitud y trayectoria en un AR. Drone 2.0 mediante Simulink. <http://hdl.handle.net/10251/184352>
- Montoya La Torre, H. N., & Jiménez Calderón, B. L. A. (2022). "Implementación de aplicaciones IoT usando el D1 mini ESP32, protocolo MQTT y servicios de IFTTT". <http://repositorio.unp.edu.pe/handle/20.500.12676/3556>



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