



XyloTron

Field-deployable Automated Wood Identification

The Forest Products Laboratory (FPL), an integral part of Forest Service Research and Development, and Forest Service International Programs are working together to provide tools to combat illegal logging and associated trade. The XyloTron, a prototype machine vision-based automated wood identification system, has been developed and permits non-specialists to identify unknown woods in the field.

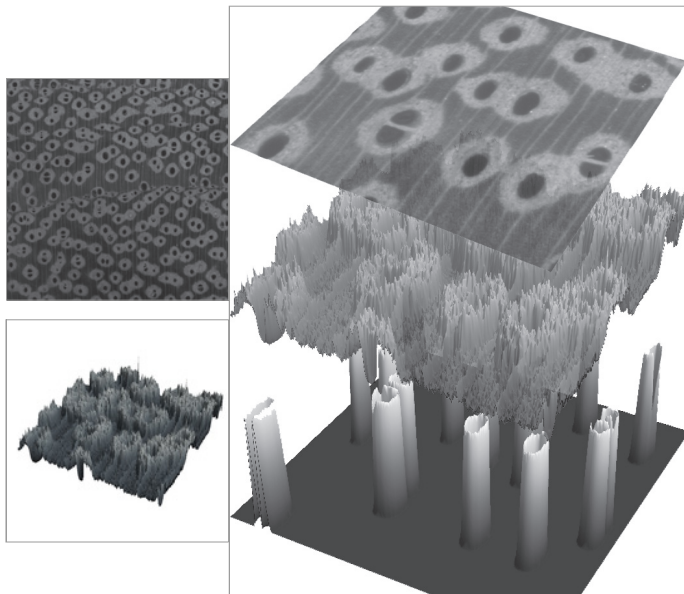
About the XyloTron

The XyloTron is a hand-held device that permits non-specialists to identify woods in the field with only minutes of training. By improving the ability of law enforcement, customs officials, forest products industries, and civic organizations to more quickly and accurately identify wood, the XyloTron will enable more efficient enforcement of and compliance with anti-illegal logging laws and policies like the Lacey Act, European Union Timber Regulation, and Australian Illegal Logging Prohibition Act.

Prototype

Prototype XyloTrons are being distributed to research partners around the world. Each XyloTron has two main components: the XyloScope, a custom-built image capture device, and an image processing unit that runs both the XyloMatic, the automated wood identification software, or XyloScan, the research image acquisition software.

To make an automated field wood identification, a user captures an image of the end-grain of the unknown wood with the XyloScope and the XyloMatic processes the image to identify the wood. The XyloTron currently identifies samples of the commercial woods of Central America at a level equal or greater than that of field personnel with one week of wood identification training.



Examples of two and three-dimensional digital images.
Credit: USDA Forest Service.



The XyloTron design will be distributed freely after scholarly articles introducing it to the scientific community are published. XyloMatic and XyloScan are based on open-source platforms, and XyloTron hardware is built from off-the-shelf components. A small amount of custom machining is necessary to prepare a simple but durable protective housing for the XyloScope. With free software and commercial components, it will be possible for researchers around the world to assemble their own systems.

Next Steps

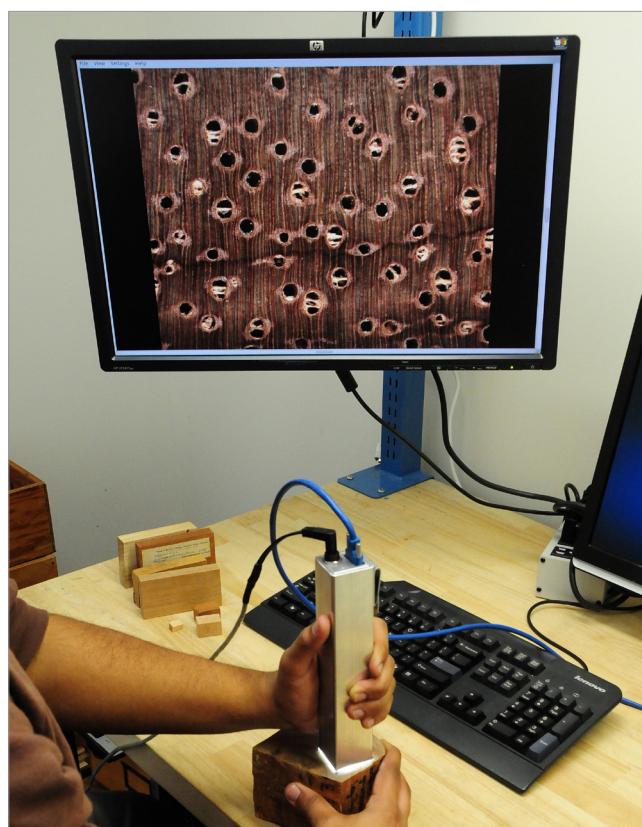
A prototype XyloTron has been used for proof-of-concept work in laboratory settings in the U.S., Brazil, Germany, England, and China, and was field-tested in the Port of New Orleans in 2013. Refinements to the system are part of an ongoing research program at the Forest Products Laboratory.

Planned future research activities include:

- Improving the hardware design with ever evolving components
- Training the Xylomatic to identify commercial Brazilian woods
- Improving, testing, and refining feature detection algorithms
- Adding explicit quantitation of anatomical characters to the system

Needed future research activities include:

- Data-mining existing and incoming images for new “characters”
- Automating specimen preparation and imaging
- Collecting data from tangential and radial surfaces of wood
- Establishing a list of critical species and confusable taxa and creating methods to separate these woods with the system
- Exploring 3D imaging of wood surfaces for enhanced character acquisition



The XyloTron prototype in action.
Credit: USDA Forest Service.

