Hands-Free Voice Directed Inventory System Overview

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FPInnovations recently tested a data collection system developed by Voice Directed Tally Systems (VDTS). Following an initial virtual demo of the product, FPInnovations agreed that the system might be interesting to FPInnovations' member companies. This InfoNote presents a summary of in-field testing conducted in March 2021.

Voice Directed Tally Systems (VDTS)

VDTS (vdts.ca) is a Belleville, Ontario-based company that specializes in hands-free voice-controlled systems (devices) for use in the agriculture, forest, and wood products industries. Their system uses the HMT-1 hardware platform from Realwear and specialized software developed by VDTS for use in aforementioned industries. The complete headset equipped with inventory tally system can be purchased from VDTS for $4500USD. The system allows the user to record many different types of data using only their voice to control the device. This frees up hands for other tasks and generally increases ease and speed of data collection.

RealWear HMT-1

RealWear (realwear.com) is an electronics hardware manufacturing company that produces "purpose-built head worn devices for industry". Their primary device is called the HMT-1 (Figures 1 and 2). The HMT-1 can be worn with or without a hard hat, includes a camera (still and video), a small display screen located in front of the user's eye, a speaker, and a microphone for voice control. The user talks to the device to control and input data into the device. Other features of the HMT-1 include, but are not limited to:

- Android operating system
- 10 GB internal storage + 64 HG SD card
- Bluetooth, Wi-Fi, consumer-grade GPS
- Drop- and water-resistant (rated to IP66)
- USB-C port
- Clinometer (range finder)
- Quick and easy connection to a computer via USB to mirror the view on the screen and use the keyboard for user input.

Figure 1. RealWear HMT-1

Figure 2. HMT-1 mounted to a hard hat.

Use Case

FPInnovations tested the device in March 2021 in several locations in Northeastern Ontario. The Timber Cruising application produced by VDTS was used and will be the focus of this InfoNote. Other uses for the inventory system that might be of interest to FPInnovations members include agriculture (potential to adapt to regen surveys), log scaling, and lumber grading.

Inventory in boreal mixedwood, hardwood, and softwood stands were collected using variable area plots. Data collected in each plot included species, dbh, and quality. The device is capable of collecting other information, but these were not collected for the study. These other parameters were casually explored but not extensively used.

Results and User Experience

The overall experience with the device was very positive, and any negatives were outweighed by the benefits. To use the device, the user configures it before heading to the job site using simple menus (Figure 3). Setup is quick and intuitive and includes specifying the parameters to be collected and setting up. In a hierarchy, a "Cruise" followed by "Stands" within the cruise, followed by "Plots" within each stand. Optionally, maps can be loaded into the device and can be used to navigate to pre-planned plot locations. Once at a plot centre, the user turns on the device, says a few short commands, and is ready to start taking inventory. Taking the inventory is very quick, and a viewable list is created as each tree is entered (Figure 4). For example, to enter tree #13 in Figure 5, the user simply says, "Species white birch, DBH 10, Grade 2, UGS, save tree". You can then move on to the next tree.

The main benefits that were found include the following:

- Hands-free operations (no clip boards) made walking in the forest much easier, convenient, safer, and enjoyable.
- Data entry was very quick saving time on site on the order of 25%. The more data collected, the more time saved.
- Data is exported in a .CSV file format and can be easily worked with.
- Fixing user errors or amending other data in the field was easy.

- There is a high level of customization for data collection parameters allowing for flexible use (Figure 5).
- The ability to take pictures of each plot and create a GPS location for each plot (not high accuracy GPS, but acceptable for the purposes).
- The ability to enter custom comments for each plot, stand, and cruise.
- Easy to use and the training time required to become moderately proficient and capable of taking the device into the field for actual use included:
  o 1 hour of one-on-one virtual training with VDTS staff
  o 1.5 hours self-exploration of the software
  o 2 hours initial testing and learning in the field
  o 30 minutes reading the manual after initial testing
  o 2 hours of completing plots at study sites and taking time to become more comfortable with the device

Some challenges found or things to be aware of include:

- The small screen could be difficult to see at times, but training on software navigation on a large screen mitigated this issue.
- The built-in relaskop/angle gauge was difficult to use, and a hand-held prism was used instead. The angle gauge on the device could have been magnified to improve its visibility. Familiarity with the system would have solved this issue.
- For the clinometer to work, it requires knowing the distance from the tree, and a built-in range finder would have been very helpful in reducing recording time, especially for applications where log lengths need to be measured. A distance sensor that can be mounted to the HMT-1 unit is currently being tested.
- The "comment" command took a few attempts to get it working properly.
- Setting up plots on-the-fly is possible, but it is best to set them up on a larger screen before heading to the forest.
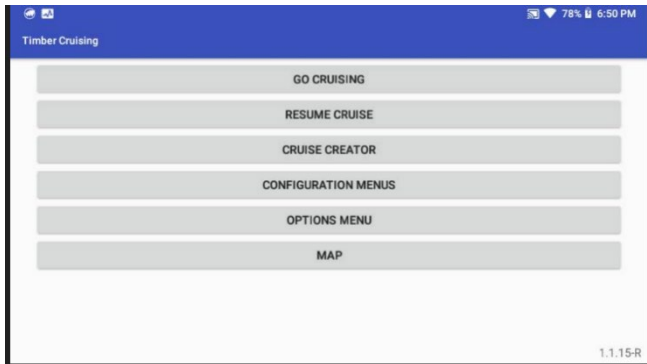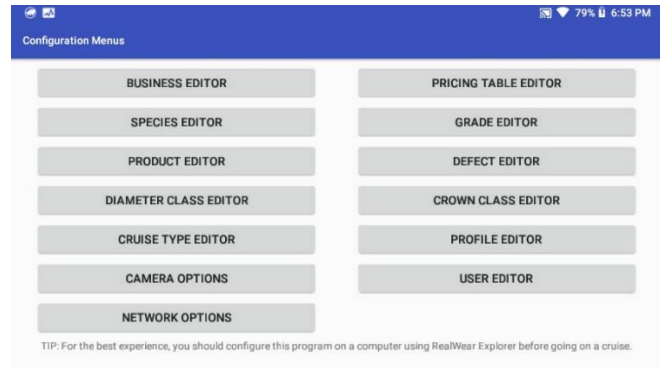
Figure 3. Main menu screen

Figure 4. Screenshot of the list of trees the user sees when entering trees into a plot.

Figure 5. Examples of some of the parameters that can be collected

Conclusions

The evaluation of the timber cruising application conducted by FPI revealed that the device can provide value to foresters. It freed up the user's hands and made the work faster and more enjoyable. Exporting data in a .CSV file makes processing quick and easy, especially for large data sets. Some modest time is needed for training as well as for practice with the voice commands and small screen.

This device is best suited to applications with one or more of the following attributes:

- Large amounts of data are being collected, and data entry after collection requires significant amount of time.
- Many parameters are being recorded at each plot.
- Terrain makes walking with full hands hazardous.
- Field data collection makes up a considerable portion of your company's work.

Opportunities to accelerate the development of visual roadside scaling of log piles through collaboration using FPI technologies/know-how developed within its research program (e.g., remote sensing) will be explored.

References

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