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MyWood-ID: LATEST TECHNOLOGY IN WOOD IDENTIFICATION

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INTRODUCTION

The Wood Anatomy Laboratory (WAL), established around 1918 is one of the oldest laboratories in the Forest Research Institute Malaysia (FRIM), which means that the laboratory has been operating for 100 years. Beginning 1934 and led by H.E Desch, the main service of the laboratory was wood identification for the public, industries and authorities. For the industry, WAL provides wood identification services especially to contractors, engineers and architects who often use wood as building materials. The use of suitable timber according to the assigned grade is important to avoid any harm to occupants. In addition, WAL also provides wood identification services to the authorities such as the Police, the Royal Malaysian Customs Department, forest departments (Peninsular, Sabah and Sarawak) and other government agencies. This service can help Customs Department in addressing the trafficking of timber species listed in the Convention on International Trade in Endangered Species (CITES) list. This wood identification service can also assist the Forest Department in dealing with illegal logging. WAL also helps the police in dealing with the issue of timber fraud. For individuals, the laboratory provides wood identification services for the purpose of obtaining the right kind of timber that coincides with the right price of timber by the supplier. This paper will show how to use this application, its advantages and the targeted groups for the application.

THE DEVELOPMENT OF MyWood-ID

Wood identification services provided by WAL are conducted by trained personnel in the field of wood anatomy. In addition, FRIM has the oldest and largest xylarium in Malaysia, i.e., Xylarium Kepong (KEPw), and the authenticated wood samples in this xylarium have been used as the reference materials for the wood identification service. To date, the wood collection in this Xylarium consists of 10,201 wood specimens of 108 families, 427 genera and 1595 species found in Peninsular Malaysia, Sabah and Sarawak.

After approximately 84 years of providing conventional wood identification services by trained personnel, FRIM now offers the latest technology for wood identification that is easy, fast and user friendly. This technology can be used by any untrained individuals. This technology is named as MyWood-ID, the mobile wood identification application software. The development of MyWood-ID started in 2015 as a joint effort between FRIM and University Tunku Abdul Rahman (UTAR). The main objective of the project was to develop a user friendly mobile wood identification application software using the latest leading edge technology. This application was designed based on the 'Deep Learning algorithm' rooting from the method of Artificial Neural Network for pattern recognition. The application software can be downloaded from Apple Store into a smartphone (iPhone 6, 6s or 7 for the moment), and it is able to identify up to 20 Malaysian timber groups without any charge. The application software will be upgraded to identify up to 100 Malaysian timbers groups in the near future where a nominal fee will be charged.

In conventional wood identification procedure, a wood anatomist would normally identify any timber group based on the following anatomical structure: 1)vessels, 2)parenchyma, 3)rays, 4)physical characteristics: colour, smell, density, ripple mark, included phloem and etc. The anatomist would then judge the timber group based on established standard keys. In the development of this identification software, all of the above criteria were not examined in detail but rather by using the capability of Deep Learning. The unique characteristics of each timber group are accomplished by pattern-recognition technology. This was done by supplying image information of each timber group using conventional photos that were digitised into computer images. There were about 1000 images per timber group used in this work. Through a series of learning procedure, the Deep Learning algorithm was trained to compare those arrays of computer images to an array of timber group names. The algorithm was trained in thousands of epoch to recognise the dominant feature extracted from each image and related it to it's timber group name. A digital model, in computer bit, was then produced for each timber group. This digital model was subsequently used to predict the timber group name when an image taken by smartphone was introduced. The training session was performed until minimum prediction error was produced, and the final digital model was used as the predictor.

This wood identification application is to be used only as a guideline to the identification of the timber group. For the purpose of accuracy and legal litigation it is necessary to refer to the experts in the field of wood anatomy. This application software is intended for identifying Malaysian timbers only, and it should not be used to identify timbers from other countries.

EQUIPMENT REQUIRED

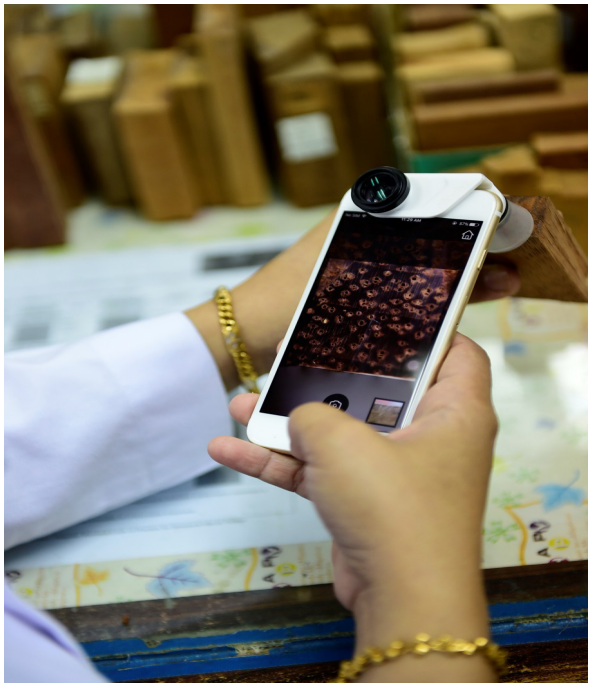
As it is a mobile system, the equipment used have to be affordable, portable, easily available and user friendly. The equipment used are iPhone, olloclip macro-lens (21x) and a sharp cutter (Figure 1). During the development of this application it was found that the best combination for accurate wood anatomical structure determination was iPhone 6,6s or 7 with the olloclip macro-lense of 21x magnification. Whilst the iPhone can be purchased at any mobile phone store, the olloclip macro-lense of 21x should be acquired online. It is to be noted that this system needs to be connected to the internet for the online wood identification to be accomplished.

Figure 1 An iPhone 6, 6s or 7, an olloclip macro-lens of 21x magnification and a sharp cutter

STEPS ON THE USE OF THE APPLICATION

1. Prepare a clear cross section using a sharp cutter

2. Click on the MyWood-ID icon (MyWood-ID is downloadable from Apple Store)



3. Place the Iphone 6/6s/7 with olloclip macro-lense (21×) on the surface prepared earlier, and click 'capture' in the application

4. Result will be obtained in a few seconds

Make sure that the structure of the cross section is clearly shown and the Iphone 6/6s/7 with olloclip macro-lense (21×) is correctly placed on the clear cut surface as shown in step 3. A blurred image will result in wrong identification.

ADVANTAGES OF USING MyWood-ID AND TARGET GROUPS

The advantages of using this application are that it is portable, requires minimal training and user friendly. It can be used by timber graders, timber inspectors, quality control inspector, log checking stations officers, enforcement officers, technicians, academicians, architects and engineers and also agencies such as forest departments of Peninsular Malaysia, Sarawak or Sabah; the Malaysian Timber Industry Board (MTIB), the Sarawak Timber Industry Development Corporation (STIDC), the Sabah Forest Industries (SFI), the Royal Malaysian Customs Department, Jabatan Kerja Raya (JKR), etc., that involve in timber group verification. Figures 2 and 3 show timber group identification examples that use the MyWood-ID application.

Figure 2 Timber group identification of logs using the MyWood-ID application

Figure 3 Timber group identification for building and small wood sample using MyWood-ID application

CONCLUSION

MyWood-ID is an application software developed for the convenience of wood identification purpose. Present techniques used for wood identification would involve experts. Now, with only an application downloaded using smartphone, wood identification can be done by any unskilled individuals. This application is easy, user friendly and fast. However, the results obtained by this MyWood-ID application should be taken as a guide only and may not be used in any court litigation. This application is to be used only for the identification of Malaysian timbers. Precise wood identification can only be carried out by a trained wood anatomist. This service is provided by the Wood Anatomy Laboratory of Forest Research Institute Malaysia.

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An application, named as MyWood-ID, is a mobile wood identification software meant for the public. MyWood-ID is an application developed for easy wood identification purpose. The present method in wood identification involves experts or trained personel to identify the timber group. With this application downloaded into smartphones, wood identification can now be done by unskilled individuals. This application is easy, user friendly and fast.

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