

# E-TUTOR FOR TRAINING IN ANTIPERSONNEL LANDMINES IDENTIFICATION

**Héctor Montes<sup>1,2</sup>, Eduardo Díaz<sup>1</sup>, Roemi Fernández<sup>1</sup>, Javier Sarria<sup>1</sup>, Manuel Armada<sup>1</sup>**

<sup>1</sup> Centre for Automation and Robotics CSIC-UPM. Ctra. Campo Real Km 0,200 La Poveda, Arganda del Rey, 28500 Madrid, Spain. E-mails: hector.montes@csic.es, eduardodiazdiaz3@gmail.com, {roemi.fernandez, j.sarria, manuel.armada}@csic.es

<sup>2</sup> Faculty of Electrical Engineering, Technological University of Panama, Panama City, Panama.

## Abstract

This paper will present the development of an e-Tutor that shows several characteristics of some antipersonnel mines. The main objective is the basic training of people that work in humanitarian demining tasks. It has been considered the development of an e-Tutor, because it can be used in Mine Action Centres from different countries for training of people that require a preparing in this activity. Additionally, the learning based on e-Tutors presents some advantages with respect to the face-to-face training, which are related with training in any time and in any place.

## 1. Introduction

Landmines represent a great problem since many years and they remain a problem today, due to the large number of them which are still buried in farm fields or areas that can be travelled by innocent children and adults [1]. The main problem is that the landmines do not distinguish between a soldier and a child, killing or wounding indiscriminately both soldiers and civilians or humanitarian workers. They present a serious threat to the safety of the population during the conflicts, and are transformed in a greater danger after the end of the fighting. For example, in a study in 2010 conducted by Landmine Monitor [2], it is mentioned that one in four accidents caused by mines had as a victim a child.

Military academies carry out specific training regarding with any type EOD including the antipersonnel landmines. Also, these institutions use surrogates landmines and real landmines in the training process. However, it is very difficult for humanitarian demining groups the access to the surrogate landmines and other relevant information about this type of EOD, for safety reasons. Some information related with surrogate landmines and/or characteristics of training process can be seen in [3-8]. The training process that is described briefly in [3-7] is face-to-face teaching.

This manuscript presents a new e-Tutor which expects carry out a first training in landmines identification in any moment and in any place without trainer. This training is for novel students in this field with the aim to show the main characteristics of the some landmines, as well as the arming and disarming procedure of them. This e-Tutor is accompanied by four surrogate landmines designed and manufactured by mean of 3D printer by CSIC-UPM. Also, this e-tutor has two first e-Tutor (sub-e-Tutors) related with a general introduction about the antipersonnel landmines and humanitarian demining, and general concepts about the neutralization by external agents.

## 2. Design and manufactured of the surrogate mines

The criteria that were considered and evaluated to select the anti-personnel mines that were designed and manufactured by mean of a 3D printer were as following: activation mechanisms, shape of the mines, data availability, and mines requested by a member of TIRAMISU consortium. Antipersonnel landmines designed should have different mechanisms of activation, different shape, and very important, the measurements availability of the landmines because the data of a lot of mines are not freely available. The landmines selected were PMA-1, Valmara-69, VS-50 and PPM-2. Figure 1 shows the surrogate antipersonnel landmines designed and manufactured by CAR CSIC-UPM. In Figure 1 the component parts of each one of surrogate landmines are presented.



Figure 1. Surrogate antipersonnel landmines designed by CAR CSIC-UPM.

The arming and disarming procedures used in the e-Tutor of each landmine were carrying out in the design stage by mean of Autodesk Inventor Professional 2014. Several pictures and video were used to recognize the component parts of the landmines. Figure 2 shows only four photograms of one video about of the arming process of the PMA-1 landmine. The trainee can control the video in order to reinforce the learning of each of the parts and the sequence of the assembling.

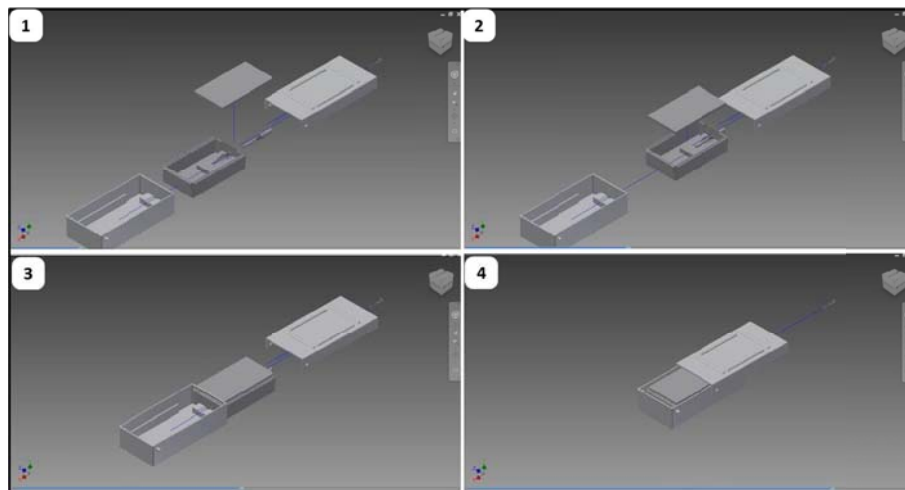


Figure 2. Photographic sequence of the assembly of the PMA-1 (from left to right and up to down).

### 3. Development of the e-Tutor

This e-Tutor has been developed in order to be used in Mine Action Centres from countries who need it. The idea is training civilian people to learn about of the identification in antipersonnel landmines, and that require preparing to work in this activity. The training can be realized in any time and in any place, because the base of the information is through of the electronic learning.

The learning based on e-tutors presents the next advantages with respect to the face-to-face training [8-9]: (i) personal learning rate, (ii) training in the time that is needed, (iii) it can reach a greater number of students. However, an important disadvantage is the non-availability of all necessary resources to carry it out.

The e-Tutor developed by CAR CSIC-UPM consists of six lessons or sub-e-Tutors, which are listed follows:

1. General description of the antipersonnel mines
2. Description of the common demining methods
3. Description of the PMA-1 landmine
4. Description of the Valmara 69 landmine
5. Description of the VS-50 landmine
6. Description of the PPM-2 landmine

The two first lessons of this e-Tutor present the main concepts of the antipersonnel mines and the landmines neutralization by external agents, respectively. The other sub-e-Tutors show the main characteristics of each

mine, the procedure of arming, disarming and disabling of each mine, and the procedure/theory about of mine neutralization by mean of external agents. The last four sub-e-Tutors are accompanied by their respective surrogate landmines designed and manufactured by the CAR CSIC-UPM, as has been mentioned about. The idea is the trainee can manipulate the mines while he is following the electronic lesson. These surrogate landmines have the main internal parts in order to be compared with its parts in the sub-e-tutors. Each lesson has a simple video of arming/disarming of each landmine with the name of each part. Figure 3 shows the two first pages of the e-Tutor, which are the registration of the trainees and the presentation by mean of video of the e-Tutor for training in antipersonnel mines. Figure 4 shows the first pages of the sub-e-Tutor related with the identification of the landmines PMA-1, Valmara 69, VS-50, and PPM-2. Additionally, this figure shows the page where the video of assembling is carried out.



Figure 3. Main pages of the e-Tutor. Pages of registration and presentation of the e-Tutor.

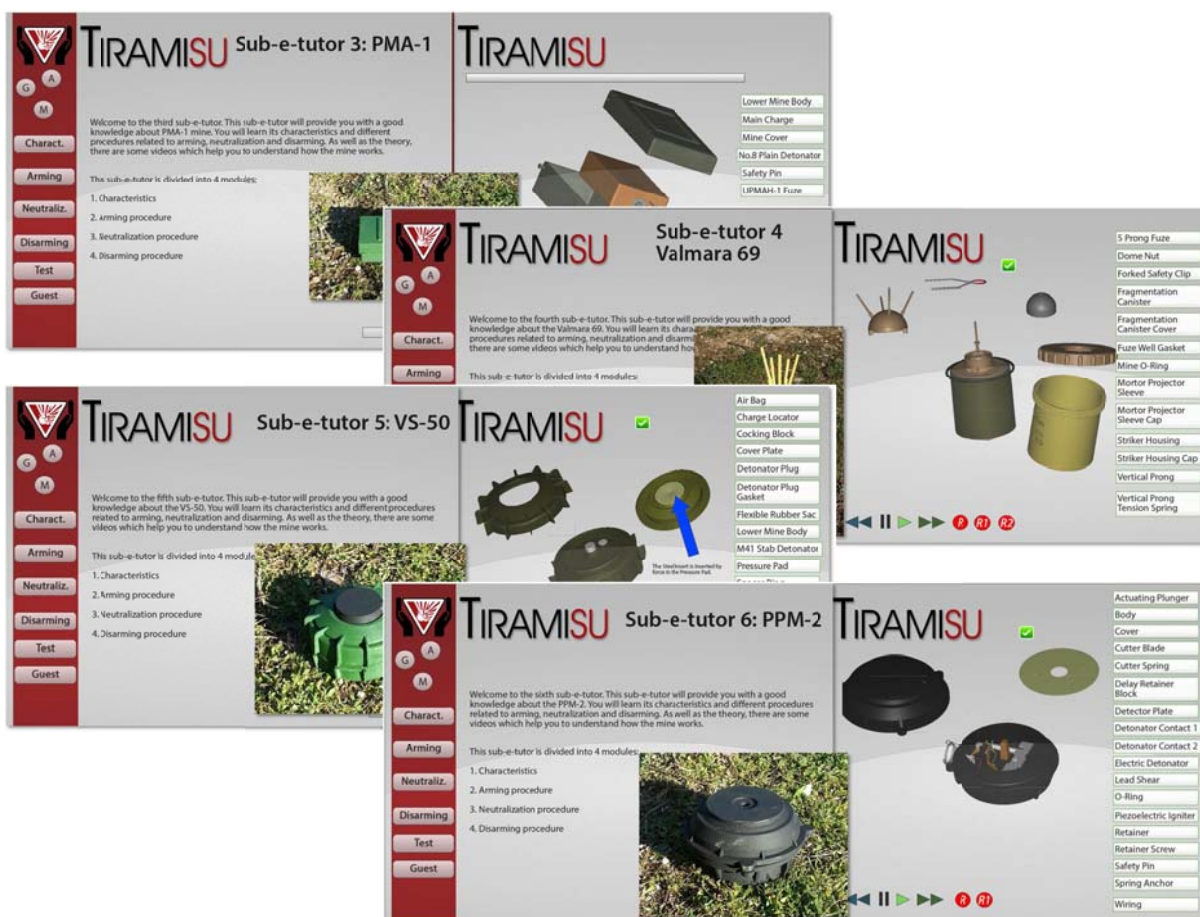


Figure 4. Main pages of the sub-e-Tutors and video slides of the landmines PMA-1, Valmara 69, VS-50 and PPM-2

Finally, in the end of each sub-e-tutor a respective test is presented, which must be approved to pass to the next sub-e-tutor. In this case the grade of pass is 85%; however this grade can be changed depending on the evaluation required. Figure 5 shows two pages related with the test of the e-tutor of VS-50 landmine.

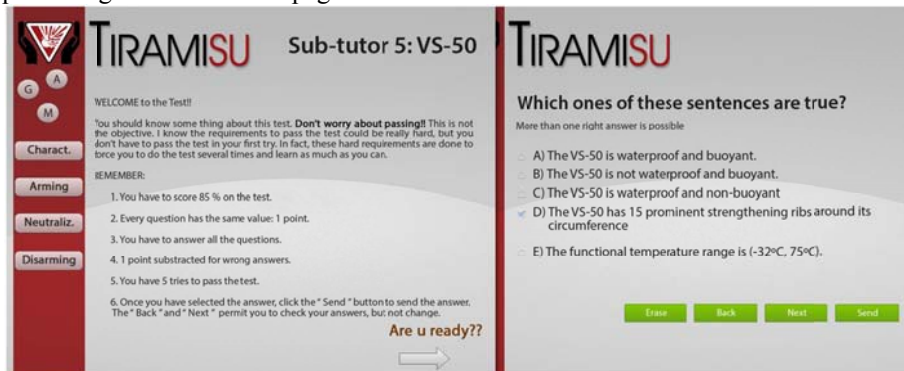


Figure 5. First page and one question of the test of the sub-e-tutor of VS-50 landmine.

#### 4. Discussion

In this work an e-Tutor for training in antipersonnel landmines identification has been briefly described. The main objective of this work is that novel trainees can have training in this field in order to they may be helpful to carry out works in this activity. Additionally, trainees can use this e-Tutor in any time and any place, and can count on with surrogate landmines to support the learning. Besides, trainees may take the necessary time to learn the lessons of suitable way.

#### Acknowledgment

The authors acknowledge funding of this work under TIRAMISU Project - Grant Agreement N° 284747 of the 7FP, and partial funding from the RoboCity2030-III-CM project (Robótica aplicada a la mejora de la calidad de vida de los ciudadanos. Fase III; S2013/MIT-2748), funded by Programas de Actividades I+D en la Comunidad de Madrid and cofunded by Structural Funds of the EU. Dr. Héctor Montes also acknowledges support from Universidad Tecnológica de Panamá.

#### References

- [1] International Campaign to Ban Landmines, (2009), Why Landmines Are Still a Problem. Landmine & Cluster Munition Monitor. Available in: <http://www.icbl.org/en-gb/problem/why-landmines-are-still-a-problem.aspx>.
- [2] International Campaign to Ban Landmines, (2011). Bangkok: Mines Action Canada, Action on Armed Violence, Handicap International, Human Rights Watch, Norwegian People's Aid. Landmine Monitor 2011. Available in: <http://www.the-monitor.org/lm/2011/resources/Landmine%20Monitor%202011.pdf>.
- [3] Chant, I., Lee, D., and Ireland D., (2005). DSTO Landmine Detection Test Targets (Approved for public release). Department of Defense, Defence Science and Technology Organisation. Australian Government. Available in: <http://www.dtic.mil/get-tr-doc/pdf?AD=ADA437868>.
- [4] AMTECH Aeronautical Ltd., (2002). Tools for de-mining equipment\_Evaluation and de-miner training. Datasheet DS94141. Alberta, Canada. Available in: <http://www.amtech-group.com/Military.Engineering/Surrogate%20Mine%20Products/Ds94141.Rev1.surrogate.small.pdf>
- [5] AMTECH Aeronautical Ltd., (2001). Surrogates for de-mining equipment\_Evaluation and de-miner training applications. Datasheet DS94129. Alberta, Canada. Available in: <http://www.amtech-group.com/Military.Engineering/Surrogate%20Mine%20Products/Ds94129.mms.rv5.no.pdf>
- [6] Tan, A.D. (2014). AOTM Advanced Ordnance Teaching Materials. 5th Mine Action Technology Workshop. 18-20 June, Pretoria, South Africa.
- [7] Paul Marks, (2013). 3D printed dummy landmines could train deminers safely. New Scientist, Vol. 219, Issue 2924, page 18, ISSN 0262-4079, [http://dx.doi.org/10.1016/S0262-4079\(13\)61666-8](http://dx.doi.org/10.1016/S0262-4079(13)61666-8).
- [8] Cabero, J., (2006). Bases pedagógicas del e-learning. Revista de Universidad y Sociedad del Conocimiento (RUSC). Vol. 3, n.º 1. UOC. Available in: <http://www.uoc.edu/rusc/3/1/dt/esp/cabero.pdf>.
- [9] Goold, A., Coldwell, J., Craig, A., (2010). An examination of the role of the e-tutor. Australasian Journal of Educational Technology, 26(5), 704-716.