TABULA RASA

Trusted Biometrics under Spoofing Attacks

http://www.tabularasa-euproject.org/

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D5.6: Final dissemination activities

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PU	Public	Yes
RE	Restricted to a group specified by the consortium (includes Commission Services)	No
CO	Confidential, only for members of the consortium (includes Commission Services)	No

D5.6: Final Dissemination Activities

Abstract:

Aim of this report is to present the final list of the dissemination activities of Tabula Rasa project. In other words, which actions have been taken to disseminate at the best Tabula Rasa achievements, and which targets have been taken into account to do these actions.

The goal of the present Dissemination Plan is to show that Tabula Rasa partners reached the largest number of public agencies, institutions, research centers, public and private Companies, novel and potential partners which could use the research products of this project.

Contents

1. Introduction

In this document, we describe the final list of dissemination activities, in agreement with the "Dissemination Plan" D5.1 of the Tabula Rasa (TR) Project.

According to the European Commission, dissemination is *a planned process of providing information on the quality, relevance and effectiveness of the results of programs and initiatives to key actors. It occurs when the results of programs and initiatives become available*.

Therefore, in this report we will list a set of actions aimed to reach a set of possible targets.

In order to design an effective dissemination plan, we followed the main guidelines suggested by several EU education and culture programs:

- clear rationale for and objectives of dissemination and exploitation;
- strategy identifying which results to disseminate and to which audiences – and designing programs and initiatives accordingly;
- identification of organizational approaches of the different stakeholders and allocation of responsibilities and resources;
- implementation of the strategy by identifying and gathering results, and execution of dissemination and exploitation activities;
- monitoring and evaluation of the effects of the activities.

Accordingly, this report is as follows. Section 2 summarizes the main targets involved in the dissemination plan, and the list of possible actions for each of above targets. Section 3 lists the dissemination actions actually performed by TR partners. Section 4 concludes the report with some observations about the effectiveness of such activity.

2. Targets and planned actions

2.1. Targets

In this Section, we list the possible targets, in terms of public and private institutions, end-users, which have been take into account for the dissemination activities of the Tabula Rasa Project.

In particular:

- Government. Those government institutions directly involved in security issues, as police departments and administrative offices. These institutions may be at different levels: local, national, and international. For example, immigration or administrative offices involved in the assessment of the best mean to assure the identity of people. It is well-known that identity cards and passports will require several ICAO biometrics, and Tabula Rasa project could make them better aware about strength and weakness of such systems against fake attacks.

- Private and public companies, involved in adopting or creating novel solutions for biometric recognition, which are not completely aware about limitation of biometrics (and possibly, of the systems on the market).

- Research community. At the best of our knowledge, even if the problem of "direct attacks" and "liveness detection" is under investigation, the topic is not yet well-known, and a few of research institutions is involved in such exploration. In this set we include also PhD and undergraduate students which would be interested in contributing on increasing the "defense degree" of biometric systems against "direct attacks".

- End-users. Due to the large dissemination of "biometric systems" in movies, which often overestimate the potentiality of biometrics, many users could think or believe that these technologies are fully "mature", and ready to be used. On the other hand, the adoption of biometrics on a large-scale of users should be taken by trying to "teach" them which are the real pros and cons of biometric technologies.

2.2. Actions

In this Section, we indicate several possible actions which have been taken into account in order to disseminate the research products of Tabula Rasa, to increase the visibility of the project partners and reach the targets listed in the previous Section.

2.2.1 Publishing and presenting project results

A number of conferences and journals could be publication targets. The submission deadline is included in brackets, or simply estimated where not otherwise available.

Joint publications will help to reinforce and demonstrate the collaboration between Tabula Rasa partners and will also serve to ensure that spoofing countermeasure technology addresses the broad spectrum of biometrics at a high level in addition to specialized, biometric-specific work. This activity will target broad-spectrum biometric conferences/journals from the list below (i.e. not restricted to a particular biometric, i.e. speaker recognition and "Interspeech"). Accepted papers will acknowledge the support provided by Tabula Rasa and will be made available for download on the project website. Worth remarking, this list is not exhaustive; thus, novel events may be added as dissemination activities of Tabula Rasa partners proceed.

Conferences

General computer vision and pattern recognition

British Machine Vision Conference (BMVC, 2011-2014)

Automatic Face and gesture recognition (FG, 2012-2014)

Computer Vision and Pattern Recognition (CVPR, 2011-2014)

International Conference on Computer Vision (ICCV, 2011-2014)

International Conference on Pattern Recognition (ICPR, 2012-2014)

European Conference on Computer Vision (ECCV, 2012-2014)

International Conference on Image Analysis and Processing (ICIAP, 2011-2013)

European Signal Processing Conference (EUSIPCO, 2011)

Biometrics and Security

International Joint Conference on Biometrics (IJCB, 2011)

Biometrics: Theory, Applications and Systems (BTAS, 2012)

International Carnahan Conference on Security Technology (ICCST, 2011)

SPIE Biometric Technology for Human Identification (SPIE BTHI, 2011)

International Conference on Document Analysis and Recognition (ICDAR, 2011)

Annual Conference of International Speech Association (Interspeech, 2011-2013)

IEEE International Conference on Face Gesture and Recognition (FG, 2012-2013)

Journals

General computer vision

IEEE Transactions of Pattern Analysis and Machine Intelligence (PAMI)

International Journal of Computer Vision (IJCV)

IEEE Transactions on Systems, Man and Cybernetics (SMC)

Pattern Recognition/Pattern Recognition Letters (PR/PRL)

Journal of Visual Language and Computing

Image Vision and Computing

Biometrics and Security

International Journal of Biometrics (IJB)

IEEE Transactions on Information Forensics and Security (IFS)

IEEE Transactions on Acoustics, Speech and Language Processing (ASLP)

International Journal of Digital Crime and Forensics (JDCF)

Computer Speech and Language

2.2.3 Promoting and organizing international competitions

Organization of international competition on several topics of direct attacks should be done in order to involve other research communities and companies from several countries. The aim is making the point about the current technology on direct attacks.

Besides the competition promotion, it must be taken into account the dissemination of data sets generated for such competitions and, in general, for obtaining the experimental results during the project. To this aim, an appropriate section named "Data set download" will be added to the current Tabula Rasa Web page.

Software/hardware based countermeasures provided during the project could be made "available" to uses through web applications, by which each interested user could be directly and concretely appreciate achievements of Tabula Rasa project.

2.2.4 Dissemination of project brand

It might be interesting to run a workshop on spoofing, covering how spoofing can be performed and any systems that we have developed for countering such attacks. In organizing such workshops, several levels of end-users must be taken into account.

Moreover, promoting lectures and tutorials on the topic of spoofing and direct attacks, on mono- and multi-modal biometric systems could be taken into account.

Another point of interest is the preparation of appropriate brochures and posters that can be brought to conferences, meetings and other events.

Finally, Tabula Rasa partners will establish two annual awards to be given to outstanding research contributions within the project ("Student Award" and "Senior Award").

2.2.5 Dissemination at large

Significant dissemination can be achieved by responding promptly to media interest. For example, recent work in ear recognition has resulted in:

- Scientific Entertainment Television (Bang goes the theory)
- News segments (ITV news, BBC Newsround)
- Magazine articles (Wired)
- High profile internet articles (Slashdot)
- Newspaper article (The Daily Telegraph)

Besides these "traditional" way of dissemination, we could also consider novel means as social networks. In the following we mention some of them:

- Facebook is a well-known social network which allows the creation of "discussion groups" which can be easily disseminated through invitation. An appropriate discussion group about Tabula Rasa could be created.
- LinkedIn is a social network aimed to professional exchanges at different levels, especially concerning research communities, and public and private companies. Even in this case, the creation of appropriate discussion group could be done.
- Mendeley is an academic social network aimed to exchanges at research level. Mendeley allows a very easy sharing and dissemination of publications and research products. The creation of a partnership devoted to Tabula Rasa should be possible.
- Youtube is a multi-media network where it is possible to share music and videos very easily. An appropriate profile for Tabula Rasa could be created in order to public the most important achievements or "lessons" devoted to multi-biometrics and their pros, cons and weaknesses. Several levels of users could be reached in this way.

Besides social networks, the dissemination of the main web-page of Tabula Rasa, by making such page very easy to consult for different levels of possible users (institutions, partners, end-users), for example by pointing out the most appropriate aspects which could move the interest of them. Finally, a specific "Tabula Rasa newsletter" could be proposed to maintain updated potential, external partners and/or users.

3. Action List

3.1. Scientific dissemination

TR partners published a large amount of scientific papers on several journal and conferences. This list is fully reported in the Tabula Rasa website (http://www.tabularasa-euproject.org/).
In this report we summarize the distribution of these papers:

Typology	Nr. of papers
Journal	17
Books	1
Conference proceedings	61

This means that, on a span of three years (but other papers are under review at the time of this report writing), TR partners published six journal papers and twenty conference proceeding per year. This is the publication rate of an average medium-size research group, and show that all partners have co-worked as a unique "body" under the coordination of the supervisor.

By focusing our attention on the journal papers, according to Google scholar, we have 92 citations, for an average of 5 citations per paper on a span of one-two years maximum, since the first journal papers have been obviously published in 2011. This is in our opinion a good result and testifies the interest of the research community for the topic of Tabula Rasa, and also the level of research performed by TR partners: among other journals, TR partners published on IEEE Transactions on Knowledge and Data Engineering, IEEE Signal Processing Letters, Pattern Recognition, Pattern Recognition Letters, Future Generation Computer Systems, and more specific journals devoted to digital forensics and privacy, as IEEE Transactions on Information Security and Forensics, International Journal of Digital Crime and Forensics and Science and Engineering Ethics.

With regard to conference papers, they show that TR partners participated to the most important meetings of the IEEE/IAPR/ACM research community: International (Joint) Conference on Biometrics, Biometrics: Technology, Applications and Systems, International Conference on Pattern Recognition, International Conference on Computer Vision and Pattern Recognition, and many others. The large number of accepted papers shows once more the great interest for the TR research topics and the large participation of TR partners to these conference will give a strong contribution in further growing the concurrence of the research community on biometric spoofing.

In order to investigate the scientific dissemination involving papers on biometric spoofing after and before the Tabula Rasa project, we exploited the features of Google Scholar and obtained a list of 3,840 results for the query "biometric spoofing" during 2010-2013. Before 2010, and

specifically, during 2000-2009, only 3,940 results were reported. This clearly proofs that the interest on biometric spoofing exhibited a very strong growth in these last three years, bringing from 38 works per year in 2000-2009 to 960 works per year in 2010-2013, that is, an increase of 2400%. Even if these numbers cannot be taken into account in real absolute terms, we believe that this percentage growth is real and that TR concurs to it.

Finally it is worth to mention that TR partners are involved in the preparation of the "Handbook of Anti-Spoofing", which will published soon by Springer. This book will summarize the main contributions of TR partners to the project and, in general, to the research community, and it is aimed to become a reference book for all researchers that are interested in investigating the problem of biometric spoofing. At the time of this report writing, all contributions have been reviewed and submitted for the final publication, which is expected on 2014.

3.2. Organization of international competitions

During the Tabula Rasa research project, two competitions have been organized by TR partners, and hosted by the International Conference on Biometrics 2013 (ICB 2013), held in Madrid, June, 4-7. By the way, this conference was organized by one of TR partners, namely, Universidad Autonoma de Madrid (UAM, Spain).

The two competitions have been:

- LivDet 2013[1] – Third Edition of Fingerprint Liveness Detection Competition, coorganized by University of Cagliari (UNICA, Italy) and Clarkson University (USA).

- Second Edition of 2D Facial Anti-spoofing Competition[2], organized by IDIAP Research Institute (IDIAP, CH).

These events were aimed to make the point about the state-of-the-art about algorithms and methods for detecting the "liveness", that is, the degree of forgery of face and fingerprint images when direct attacks are performed in terms of "fake" faces or "fake" fingerprints.

Both competitions were follow-up of successful competitions which have been hosted, in the past, by First International Joint Conference on Biometrics (IJCB 2011), 15th International Conference on Image Analysis and Processing (ICIAP 2009), and 5th International Conference on Biometrics (ICB 2012).

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[1] http://pralab.diee.unica.it/LivDet13
[2] http://www.tabularasa-euproject.org/evaluations/icb-2013-face-anti-spoofing

The final reports have been submitted to ICB 2013 and published in the proceedings of the conference.

The large number of participants for both events (an average of ten participants per competition), showed that several research communities are involved on biometric spoofing attacks topics. From the point of view of scientific results, it has been shown that, whilst fingerprint spoofing is still an open issue, facial spoofing is well counterattacked by effective liveness detection algorithms. For further information, the full papers reporting the basis results of both competitions are available at the IEEE Xplore website.

The organization of three conferences has been another remarkable activity for the scientific dissemination of the projects results. In particular, CSSC organized the Workshop on Spoofing and antispoofing: the wider human context; UOULU and other TR partners co-organized the International Workshop on Computer Vision with LBP (LBP2012); UAM organized the International Conference on Biometrics (ICB 2013).

3.3. The Tabula Rasa Spoofing Challenge

A very particular event organized by TR partners has been the Tabula Rasa Spoofing Challenge[3].

The goal of this challenge was to stimulate novel ideas to spoof state-of-the-art biometric authentication systems with 4 different modalities:
- 2D face in visible spectra (IDIAP)
- 2D face in infra-red spectra (CASIA)
- Speech (Eurecom)
- Fingerprint (UNICA and UOULU)

Each system was reinforced with countermeasures for numerous attack types and the participants were invited to find ways to break through the system using their imagination and creativity.
For each system, a small set of subjects was enrolled as authenticated users. For the first group of enrolled persons, the face images, voice recordings or fingerprints were made available through this website, in order to be used in forging the attacks.
However for the second group, only the identity information was released and their biometric samples had to be acquired by the attackers themselves. For this purpose, these subjects were selected among the attendees of the conference and their enrollment were done on-site.

During 2 afternoons, in addition to the attempts of the attackers, there were many interesting demos, showing the system performances with and without countermeasures, accompanied by informative posters. Additionally for fingerprint spoofing, gummy fingers were presented via a small instructional workshop on how to forge them.

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[3] http://www.tabularasa-euproject.org/evaluations/tabula-rasa-spoofing-challenge-2013

The challenge was a success with many contestants and visitors. In total, 9 attacks participated in the challenge - 6 in face verification (both Vis and NIR) and 3 in fingerprint verification. Additionally, almost all of the conference attendees stopped by and tried the demos. We got a big opportunity to discuss with the community about the vulnerabilities of biometric systems against spoofing attacks and to show them the current state of the problem with live demos.

The most brilliant attempt among 9 contestants, which was decided on its spoofing success and originality, was awarded with the "Best Spoofing Attack Award", accompanied by an incentive prize: a Samsung Galaxy Tab 2.

Using make-up to look like one of the enrolled subjects, the winner tried to spoof the 2D face recognition system in visible spectra and succeeded to be recognized as her victim. Additionally, due to the intrinsic nature of the attack, she could easily bypass the liveness detection based counter-measures that were implemented in the system.

3.4. Meetings, visits and exhibitions

During the project, TR partners did several visits to other academic institutions and were invited at several workshops and meetings. At these meetings, they have had the opportunity to promote the TR project and show their own activities on biometric spoofing.

At the same time, industrial partners participated at several exhibitions and workshops to promote their products associated with the Tabula Rasa's brand.

Among others, we may cite some of the visits occurred in 2013:
- University of Warwick (UK), Technical University of Munich (Germany), Northwestern Polytechnical University (Xian, China), EU-Joint Research Centre (Italy).

And the participation to several exhibitions and meetings:
- ID World Exhibition (Abu Dhabi), Mobile World (Barcelona), Management Level at VISA Europe (Southampton), Certification Centre (Ministry of Internal Affairs, Tallinn, Estonia, and Ministry of Interior, Vilnius, Lithuania), Deutsche Telekom, DT-pickANDpay, T-Mobile, DT-Product and Innovation.

3.5. Dissemination at large

As pointed out in the previous D5.4 technical report, the Tabula Rasa project has enjoyed excellent media coverage ensuring dissemination well beyond the more usual academic and commercial avenues, especially at this stage. This has included appearance on international media such as Discovery, Forbes, Computerworld and Wired, and including Finnish Television and in French and Italian media as Banca and Finanza and LinuxPro magazines, as well as local newspapers.

The Tabula Rasa project aims to prevent these security breaches, as Wired reports. Youtube, LinkedIn and other social networks continue to remain a popular vehicle for research dissemination, and already feature Tabula Rasa research. Other dissemination activities included coverage in Institutional newsletters: recently, the TR project has been largely cited in several press releases promoted by the European Union[4].

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[4] http://europa.eu/rapid/press-release_MEMO-13-924_en.htm

4. Discussion

Fig. 1 shows the visits frequency to the TR website[5] from the start of the project (2011) to december, 2013.

It can be noticed a peak due to the starting of the press campaign after July 2013.

Fig. 1. Frequency of visits of the TR project website.

Over 11,000 visits have been counted. The half of them are due to returning visitor. This shows that, one people over two is really interested to the topic and the advances of the project.

Half of visitors belong to English-speaking countries, the remainder of them are from other UE countries like Germany, France, Switzerland, and Italy.

Some interesting information is also given in Fig. 2 where we reported the typology of visitors during 2013, vs. the same typology during 2012.
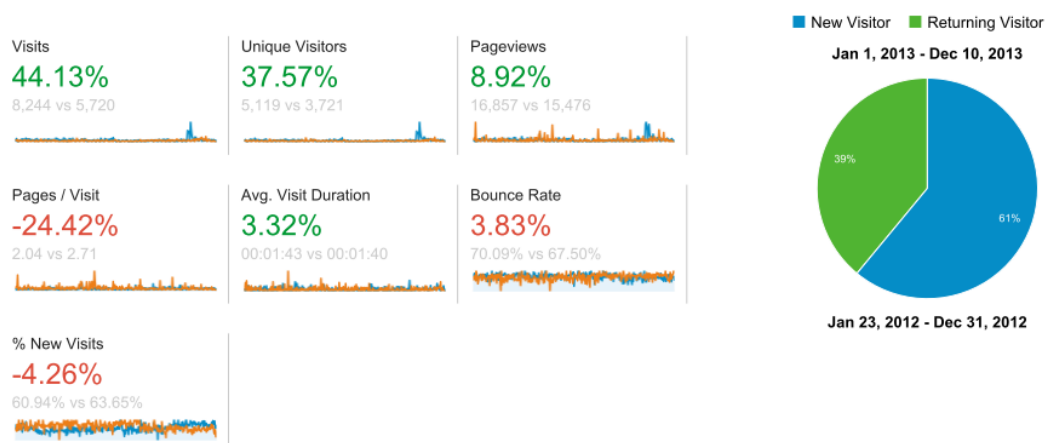

Fig. 2. Typology of visitors on the time-span Jan 1, 2013-Dec. 10, 2013.

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[5] http://www.tabularasa-euproject.org

It can be noticed that the percentage of returning visitors in 2013 is over the value reported on overall and 2012, and this means that in the last years the percentage of visitors really interested on biometric spoofing topic conducted by TR partners is increased as well. This can be interpreted as a positive result for the dissemination activity of the project: Tabula Rasa contributed to the growth of interest on the problem of direct attacks. At the same time, the duration of each visit increased wrt 2012, and this could mean that the visitors stay at looking the TR webpage for more time, in order to get the information they need.

A confirmation of this trend is given by focusing on the last two months of 2013, reported in Fig. 3. The number of returning visitors is notably increased and also the duration of each visit.
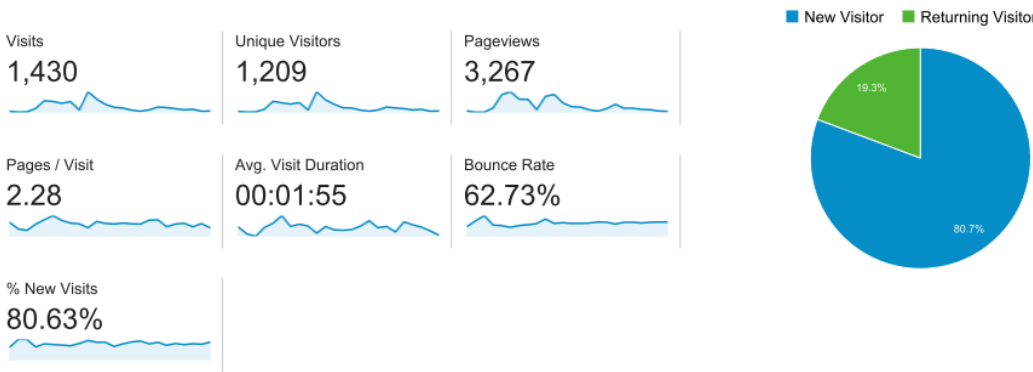

Fig. 3. Typology of visitors between Oct., 18 and Nov., 10, 2013.

Another interesting feature to measure the degree of interest for the Tabula Rasa project is to evaluate the visits on the videos available on the Tabula Rasa youtube channel[6]. Unfortunately, the channel is online by may, 2013, and, thus, it is not possible to do a full evaluation of the TR success by this instrument.

On the other hand, over the 14 videos published on the Youtube channel, it is possible to see that the number of visits is about 2,000 (thus we have an average of 300 visits per month). Fig. 4 reports the percentage of visits devoted to each video. These percentages show that the most interesting videos are the ones clearly showing the effect and type of attacks and related countermeasures. In other words, the most visited videos are the ones designed for being a sort of "tutorial" to spoofing attacks, in order to explain what they are, and how counterattack to them.

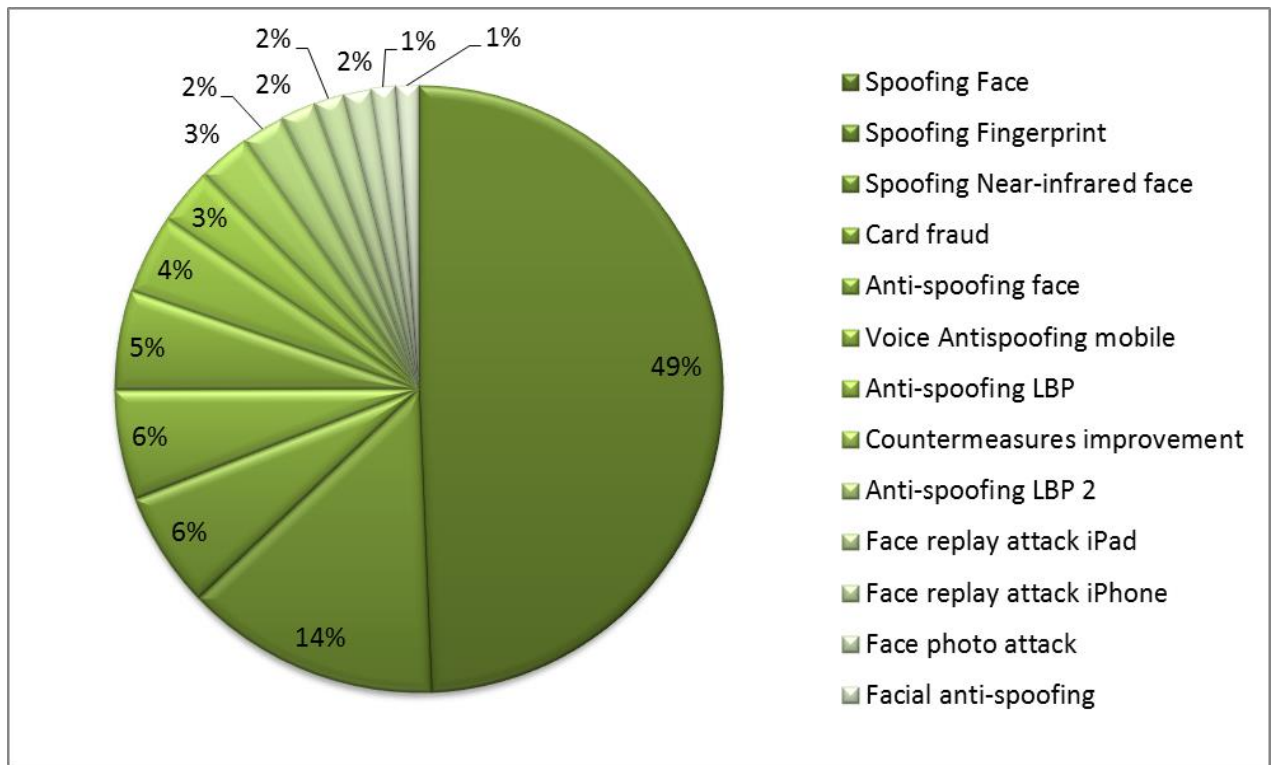[6] http://www.youtube.com/channel/UCoHA9lGDrtEUim_mdtPwQ6w/feed

Fig. 4. Distribution of 2,000 visits to the Tabula Rasa Channel on youtube.

5. Conclusions

In this technical report, we summarized the main dissemination activities aimed to disseminate the results of Tabula Rasa research project. The complete list of publications, events and news can be found at the TR website.

We have shown that the list of actions has been quite large and covered several kinds of activities: from the scientific dissemination to the dissemination at large.

Reported results of such dissemination activity are encouraging and show the growing interest of the research community to the topic of the project. We believe that all TR partners, thanks to their strong activity in disseminating the project results, have concurred to the increase of this very hot topic in order to try solving the real issue of biometric spoofing for the future and the reliability of biometric systems.