Open Source in Universities

Case Studies from the Coal Face

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OSPO Director
Trinity Research & Enterprise

December 2023
Who am I?

• Currently ICT Commercialisation Manager at Trinity College

• BSc in Applied Physics and Electronics, and PhD in Geophysics

• Founder of 3 tech start-ups, 2 of which raised 7 figure venture capital rounds and 1 of which Alatto traded for 9 years with sales averaging over €1m per year

• While in Trinity I set up and ran Trinity College's start-up accelerator LaunchBox.

• While Executive Director of Blackstone LaunchPad at Trinity I designed and secured European funding to implement Trinity’s Connected Health accelerator “Validator”.

• Set up Open Source Programme Office (OSPO)
Grand Canal Innovation District
A Transformational Opportunity for Ireland
Trinity College Dublin

A research intensive University in the heart of Dublin City

No.1 University in Ireland

QS World University Rankings, THE World University Rankings and the Academic Ranking of World Universities (Shanghai)

Top 1% of research institutions in the World in 17 Essential Science Indicator Fields

Physics, Chemistry, Engineering, Social Sciences (General), Immunology, Neurosciences, Nanosciences, Materials Science, Pharmacy and Toxicology, Molecular Biology and Genetics, Biology and Biochemistry, Microbiology, Plant and Animal Science, Clinical Medicine, Agriculture, Psychiatry/Psychology, Environment/Ecology.
Technology Transfer at Trinity, 2017 - 2021

- **487 industry collaborations**: 45% with SMEs

- **103 consultancy engagements**: 15% with AHSS

- **318 inventions disclosed by Trinity staff**: 84 patents filed

- **209 active licenses**: €6m licence income since 2000*
  - 114 new licences
  - 60% to SMEs
  - 22% underpinning spin-out investment

- **3 spin-out exits worth €680m total**

- **29 products and services launched on the market**

- **3 spin-out exits worth €680m total**

- **24 spin-outs**: 16 High Potential Start-ups

- **€200m in investment**

- **>350 jobs created by spin-outs**

- **€16m for 43 EI Commercialisation Fund projects**

- **€80m raised by University Bridge Fund 2**

- **Plus… IP rights, confidentiality, GDPR, data and materials transfer, and state aid**

- **And… active in many professional bodies: AUTM, LES, ITTG, WILA, ASTP**
"UNIVERSITIES OWN ACADEMIC RESEARCH PUBLISHING BUT THEY DO NOT OWN SOFTWARE PUBLISHING"

JOHNS HOPKINS UNIVERSITY
Open Source Programme Office (OSPO)

The OSPO is a division of the OCPKE and has been established with the objective of promoting and supporting the principles of open source, in knowledge transfer and industry engagement within Trinity College. The office empowers researchers to execute on their open source strategies by providing advice and the tools they need.
MISSION OF TCD OSPO

INBOUND

CONSUME OPEN SOURCE PROJECTS

OSPO

CONTRIBUTE AND RELEASE OPEN SOURCE

OUTBOUND
Mission Open Source Program Office (OSPO)

To maximize the Trinity’s return on investment in research and reduce the risks of consuming, contributing to, and releasing open source software.
As Open as Possible.
As Closed as Necessary.
WHAT HAVE WE DONE?
2003:

**Sphere-Tree Construction Toolkit**

**Overview**

Interruptible collision detection aims to provide real-time simulations with constant high frame-rates. This is achieved using a proxy object to represent the objects. This proxy object is then used to perform level-of-detail collision handling in a time-critical fashion. The most common proxy representation is a sphere-tree, which represents the objects as a hierarchy of spheres. Our sphere-tree construction toolkit implements a number of algorithms for the construction of sphere-trees. These algorithms include our new algorithms, which are detailed in various publications.

**Algorithms**

The sphere-tree construction framework contains a number of different algorithms. The Octree and Hubbard algorithms implement the existing algorithms upon which we have based our comparisons. Our own algorithms are based around the notion of a Sphere Reducer. The sphere reducer algorithms produce a set of spheres to approximate a sub-section of the object's volume. The Sphere Tree Generator algorithm controls the construction of the sphere-tree by managing how the object is sub-divided. When a set of spheres is constructed the generator uses the spheres to partition the object into a number of regions, each of which is then approximated using a sphere reducer algorithm. There are also a number of optimisers available in the toolkit. The generator algorithm can apply an optimiser to a set of spheres to improve the approximation prior to their inclusion in the sphere-tree. Many of our algorithms are based on Hubbard's medial axis algorithm. We, however, have extended the notion to allow the medial axis to be approximated in an adaptive manner. Initially the medial axis approximation would contain a relatively small number of spheres, typically 500 to 1000. This is sufficient to construct the top level of the sphere-tree, which would typically contain around 8 spheres. Prior to the approximation of the sub-sections of the object the adaptive medial axis approximation algorithm is used to improve the medial axis around the region being processed. This means that the medial axis will always be detailed.
2003: ( What Not to do!)

Downloads
You can download a ZIP archive containing ALL the models and sphere-trees that we have featured on this page. The models are supplied as OBJ files and SUR files, which contain pre-computed triangle neighbourhood information for faster loading.

The sphere-tree construction algorithms are also freely available for download. The GUI version is only available for windows platforms but the command line version works on any UNIX-like system, i.e. those capable of compiling supporting programs distributed using autoconf and automake.

Source Code:
Version 1.0 (Feb 2003) DOWNLOAD...

Pre-compiled Binaries (Win32):
Version 1.0 (Feb 2003) DOWNLOAD...

Sample Data: DOWNLOAD...
2003: (What Not to do!)

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Source Code:  
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Sample Data:  DOWNLOAD...
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Please include with this submission:
- A copy of the software made available via direct transfer of files or through access to a code repository (including source code)
- A copy of any accompanying material, such as a user guide

6. Does the software include any open source or free software?
   
   ✔ _Yes ___ No

   (If YES, please identify the software and the license under which it was licensed.

   See Appendix B

   All code and Materials included in the software that were not developed by the authors must be listed in this disclosure.)

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   _Yes _ ✔ _No

   (If YES, please name the preferred license (e.g. BSD or GNU GPL) or describe the desired terms and conditions.)
2010:

The most trusted open software for mobile wireless networks.

We’re unique in making our 4G & 5G UE & RAN source code available for fine-grained commercial customisation.
2011: OSS discovered in SDF

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Delivering assessment-based training and education on the how, why and when to perform hand hygiene to help to reduce infections, manage risk, and support the achievement of external certification for infection control.
2013:

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%

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% This code is a part of the Voice Analysis Toolkit with the following licence:
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% making the subsequent code open source. For more information regarding
% our commercial licence, please contact john.whelan@tcd.ie
Deal-hungry Google snaps up TCD-based virtual reality startup
2019:

AN OPEN-SOURCE IN-MEMORY DOCUMENT GRAPH DATABASE

Build quickly with the simplicity of JSON documents and turn objects into powerful knowledge graphs to solve complex problems.

Installation Details
Zorin OS 15 Celebrates 1.7 Million Downloads As Newest Version Releases

A freshly updated version of Zorin OS 15 — a great beginner-friendly Linux distribution based on Ubuntu — releases this week with a handful of important updates and hardware compatibility features.
OSS Business Models:

Build robots, not infrastructure

Airbotics is an API-first, open-source cloud robotics platform to connect your robots to the world.
# OSS in Genomics:

<table>
<thead>
<tr>
<th>Tool</th>
<th>Owner</th>
<th>Notes:</th>
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<tbody>
<tr>
<td>GATK4</td>
<td>Broad Institute, Inc</td>
<td>GATK4 is released under an open source license. Depending on the specific tool and specific version you are hoping to use, this may be either the &quot;New&quot; BSD license or the Apache-2.0 license. Please refer to the &quot;LICENSE.txt&quot; file of the applicable code repository to confirm which specific license governs the code you are interested in using.</td>
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| VCFtools  | The program package is maintained and developed by:  
- Adam Auton (C++ Module)  
- Petr Danecek (Perl Module, HTSlib)  
- Anthony Marcketta (C++ Module) | Made available under GPL v3  
- Use of the code for commercial purposes: GPL v3 imposes no conditions on the internal use of the software.  
- Change the code: Users can change or rework the code, but if they distribute these changes/modifications in binary form, they’re also required to release these updates in source code form under the GPL v3 license.  
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- Like its predecessor, GPL v3 does not allow users to sublicense the code.  
- In other words, you cannot rework, alter, or add to the code, then close those changes off to the public.  
- The “open source-ness” of the original code follows any update or addition. |
| BCFtools  | Software is available under a choice of one of two licenses. Can chose to be licensed under the terms of the MIT/Expat license or the GPL V3 | GPLv3 – As per above  
The MIT/Expat License  
Copyright (C) 2012-2023 Genome Research Ltd. |

VCFtools is a program package designed for working with VCF files, such as those generated by the 1000 Genomes Project.

The aim of VCFtools is to provide easily accessible methods for working with complex genetic variation data in the form of VCF files.

VCFtools consists of two parts, a perl module and a binary executable. The perl module is a general Perl API for manipulating VCF files, whereas the binary executable provides general analysis routines.
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Impact

Open Source

Devil is in the detail

Publishing

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• Educate Researchers and other parties
  • EI/SFI/LERU/IDA
• Embrace Open Source Ecosystem in Startups and Industry
• Produce mini-guides and infographics
open source hardware
Remember For Businesses: