Duckietown

Maintainer: Andrea Censi, Liam Paull
PART A
General info
Duckietown is a robotics education and outreach effort. It started at MIT in 2016 and now includes hundreds of people around the world.

1.1. Mission

1.2. Goals and objectives

The most tangible goal of the project is to provide a low-cost educational platform for learning about autonomous systems, consisting of lectures and other learning material, the Duckiebot autonomous robots, and the Duckietowns, which constitute the infrastructure in which the Duckiebots navigate.

We focus on the learning experience as a whole, by providing a set of modules, teaching plans, and other guides, as well as a curated role-play experience.

We have two targets:

1. For instructors, we want to create a “class-in-a-box” that allows people to offer a modern and engaging learning experience. Currently, this is feasible at the advanced undergraduate and graduate level, though in the future we would like to provide a platform that can be adapted to a range of different grade and experience levels.

2. For self-guided learners, we want to create a “self-learning experience” that allows students to go from having zero knowledge of robotics to a graduate-level understanding.

In addition, the Duckietown platform is also suitable for research.

1.3. Learn about the Duckietown educational experience

The video in Figure 1.2 is the “Duckumentary”, a documentary about the first version of the class, during Spring 2016.

Figure 1.2. The Duckumentary, created by Chris Welch

The video in Figure 1.4 is a documentary created by Red Hat on the current developments in self-driving cars.
If you’d like to know more about the educational experience, [1] present a more formal description of the course design for Duckietown: learning objectives, teaching methods, etc.

1.4. Learn about the platform

The video in Figure 1.6 shows some of the functionality of the platform. If you would like to know more, the paper [2] describes the Duckiebot and its software. (With 30 authors, we made the record for a robotics conference!)
2.1. The beginnings of Duckietown
The original Duckietown class was at MIT in 2016 (Figure 2.2).

Figure 2.2. Part of the first MIT class, during the final demo.
Duckietown was built by elves (Figure 2.4).

Figure 2.4. The elves of Duckietown
These are some advertisement videos we used.

Figure 2.6. The need for autonomy
2.2. University-level classes in 2016
Later that year, the Duckietown platform was also used in these classes:
- National Chiao Tung University, Taiwan - [Prof. Nick Wang];
- Tsinghua University, People’s Republic of China - Prof. (Samuel) Qing-Shan Jia’s Computer Networks with Applications course; and
- Rensselaer Polytechnic Institute 2016 - Prof. John Wen Robotics I course.

2.3. University-level classes in 2017
In 2017, these four courses were taught together, with the students interacting among institutions:
• ETH Zürich 2017 - Prof. Emilio Frazzoli, Dr. Andrea Censi, Dr. Jacopo Tani (Figure 2.14);
• University of Montreal, 2017 - Prof. Liam Paull;
• TTI/Chicago 2017 - Prof. Matthew Walter; and
• National Chiao Tung University, Taiwan - Prof. Nick Wang.
Furthermore, the Duckietown platform was used also in the following universities:
• Rensselaer Polytechnic Institute - Prof. Jeff Trinkle's Algorithmic Robotics course;
• National Chiao Tung University, Taiwan - Prof. Yon-Ping Chen's Dynamic system simulation and implementation course;
• Chosun University, Korea - Prof. Woosuk Sung's course;
• Petra Christian University, Indonesia - Prof. Resmana Lim’s Mobile Robot Design course;
• National Tainan Normal University, Taiwan - Prof. Jen-Jee Chen’s Vehicle to Everything (V2X) course; and
• Yuan Zhu University, Taiwan - Prof. Kan-Lin Hsiung’s Control course.

Figure 2.14. Duckietown at ETHZ in 2017

2.4. 2018 and beyond
The classes are too many to list.

2.5. Statistics
This section reports some aggregated statistics of the courses at graduate and undergraduate level that used the Duckietown platform in 2016-17, listed above.
Figure 2.16. Number of students and staff for the Duckietown graduate level class

Figure 2.18. Number of reported students and staff for graduate and undergraduate classes using the Duckietown platform. These figures do not include [Duckietown HS](#dt-hs) alumni (200 up to 2017)
Figure 2.20. Statistics of Duckietown alumni

Figure 2.22. Backgrounds of students and staff
Choose what best describes you:
• **graduate-level instructor** or
• **self-guided learner** or
• [commercial partner/distributor][#for-companies].

3.1. Duckietown for graduate-level instructors

3.2. Duckietown for self-guided learners

3.3. Introduction for companies
If you are a company, and interested in working with Duckietown, please jump to Section 3.3 - Introduction for companies.

3.4. Media

3.5. Developers
| If you want to contribute to the software... XXX
| If you want to contribute to the hardware... XXX

3.6. Translators

3.7. Website developers

3.8. Just interested in spreading the word
Back matter
Bibliography
