# Red Hen Lab: a further step towards multimodality
[report]

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## Abstract

This paper presents the Red Hen Lab, a consortium for research on multimodal communication directed by Frances Steen and Mark Turner. The consortium plays an important role for researchers interested in multimodal communication since it works with massive datasets obtained from recorded media that, after being captured, indexed, analysed and taxed, become searchable. The principal instrument for the research of the Red Hen Lab is the capture station, where data are collected and then sent to the centre of analysis. The material is then manually tagged using ELAN in order to be distributed. What is important is that building a capture station is very easy, and so it is possible to get big data from a different part of the world. Furthermore, the Red Hen Lab, as a transdisciplinary project, offers various opportunities of collaboration referring to different disciplines.

## Introduction

This paper aims to present the project of Mark Turner and Frances Steen: the Red Hen Lab (called Red Hen). The project is interesting for the scientific community beacause it opens new scenarios for the communication studies, in particular, gathering images, videos, gestures, speech and human performances, assures materials and sources that can be useful for future scholars to analyse several phenomenon of contemporary age. The Red Hen Lab plans to collect heterogeneous material coming from different parts of the world in order to facilitate research in the field of multimodality. Moreover, the presence of various kinds of data allows scholars to compare the representation of the same phenomenon across many countries and cultures. It can be stated that Red Hen is an example to follow because it permits to improve the sharing of data in the scientific community.

## The work of Red Hen

The Red Hen Lab is a consortium for research on multimodal communication, a field of study developed during the first years of the 21st century thanks to several scholars like Gunther Krees, Carey Jewitt, Neil D. Fleming and many others whose research interests differ. The term multimodality refers to:

> a theory which looks at the many different modes that people use to communicate with each other and to express themselves. This theory is relevant as an increase in technology tools, and associated access to multimedia composing software, has led to people being able to easily use many modes in art, writing, music, and dance and every-day interactions with each other (Krees 2006).

It is an element on which scholars have recently focused on:

> The characteristics of contemporary societies are increasingly theorized as global fluid (Baumann, 1998), and networked (Castells, 2001). These conditions underpin the emerging knowledge economy as it is shaped by the societal and technological forces of late capitalism. These shifts and developments have significantly affected the communicational landscape of the 21st century. A key aspect of this is the reconfiguration of the representational and communicational resources of image, action, sound, and so on in new multimodal ensembles (Jewitt 2007: 241).

In particular, the Red Hen Lab (http://redhenlab.org), called "Red Hen" for short, aims to develop new methods so as to help scholars who deal with multimodal communication in computational, statistic, and technological fields[1]. The consortium is co-directed by Francis Steen, professor of Communication Studies at the University of California, Los Angeles, and Mark Turner, professor of Cognitive Science at Case Western Reserve University, in Cleveland, Ohio.

Red Hen works with massive datasets from recorded media: images, videos, gestures, speech, text, music, and other human performances. The data, captured, indexed, analysed, and taxed, are then searchable. Various research tools can be applied to it, such as statistical analysis, audio and visual analysis, natural language processing tools, and machine learning tools. The fundamental instrument for the research of the consortium is a capture station, an instrument that captures images, videos and facial expression and collects these data. The capture station works with software like ELAN and instruments like television and personal computers like e.g. Raspberry Pi. Later, the acquired data are shipped to centres of analysis. The principal data captured are television news broadcasts, but the tools developed by Red Hen apply to many varieties of media, from text to video games. Red Hen mainly uses as the computational basis of a capture station a Raspberry Pi (a "credit card" computer produced by the Raspberry pi foundation[2] which aims to help children who want to study informatics). Captured data are explored to a certain extent at the local capture station and then sent for further analysis elsewhere in Red Hen's distributed network. This analysis can include anything from indexing for search engines to manual tagging using ELAN, which is

> a professional tool for the creation of complex annotations on video and audio resources, see https://tla.mpi.nl/tools/tla-tools/elan. It is a java-based desktop application that runs on Windows, OS X, and Linux. We are integrating ELAN into the Red Hen workflow by creating standard annotation templates, providing basic instructions to get started, writing export scripts that convert ELAN annotations into Red Hen formats, and writing import scripts that allow ELAN to read Red Hen files. Annotations from ELAN can in turn be made available to students and researchers in machine learning, who will use the annotations to create classifiers that aim to discover the same patterns in a larger dataset and thus automate certain aspects of the annotation task[3].

ELAN is software compiled in JAVA, compatible with most operating systems: proprietary systems, like Windows or Mac OS, designed by Microsoft and Apple, or open source systems, like Gnu Linux distributions (Ubuntu, Xubuntu, Kubuntu, Linux Mint, Debian, Fedora). ELAN allows scholars to tag videos and images according to «*Red Hen Lab formats*»[4]: These tags are

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[1] C.f. https://www.redhenlab.org/ [access date: 23/07/2016].

[2] C.f. https://www.raspberrypi.org/ [access date: 23/07/2016].

[3] https://sites.google.com/site/distributedlittleredhen/home/tutorials-and-educational-resources/-how-to-annotate-with-elan, [access date: 23/07/2016].

[4] Ivi.

"metadata," which can be searched and analysed inside the Red Hen system. ELAN is open source software that can be downloaded from the official website[5].

The capture station is the keystone of the Red Hen Lab's research, an indispensable element of Red Hen's data acquisition process. Today, Red Hen captures data in many languages, including French, Spanish, Portuguese, German, Norwegian, Danish, Swedish, and Russian, but not yet in Italian. It would be easy for Red Hen to incorporate data in Italian, if there were an Italian capture station. The establishment of a capture station is technically easy, and by now Red Hen has automated nearly all parts of capture except initial installation and routine maintenance. To establish a capture station, it is sufficient to follow the instructions on the official Red Hen website. Installation requires a secure location, a Raspberry Pi 3B, an HDhomerun TV tuner, an externally powered hard disk sufficient to hold briefly the captured files, electrical power, TV signal delivered through cable, and Ethernet for both the Raspberry Pi and the HDhome run. The Raspberry Pi operating system, Debian Linux, runs on a microSD card inserted into the Raspberry Pi itself.[6] But the Raspberry Pi capture station is only one design, and the smallest. Others are possible.

After the placement of the equipment, it must undergo the process of customization for the local conditions of broadcast.[7] The directors can advise on the subject of customization. Once this phase has been completed, there is nothing left to do, since the routine maintenance of the station requires neither sustained attention nor technical ability. Attention is needed only if the equipment fails or if there are local changes in the Ethernet system or the broadcast reception. What is indispensable to Red Hen is an expert in local culture who can accordingly indicate which news broadcasts to capture, whether there are special broadcasts that should be captured, and so on. Also, Red Hen needs someone who knows natively the language of the broadcast.

The project of analysis and archiving of the Red Hen Lab consortium of Francis Steen and Mark Turner is financed by very worldwide-known companies such as Google, the owner and creator of the most used web search engine. But it is not the only company which considers Red Hen Lab to be relevant and innovative:

> Red Hen's cross-disciplinary research projects have been funded by the Cyberenabled Discovery and Innovation program of the US National Science Foundation CNS 1028381 and 1027965 (2010-2016, PIs Zhu, Groeling, Steen, & Zhai), the Anneliese Maier Research Prize from the Alexander von Humboldt Foundation awarded to Turner (2016-2020), the Research Council of Norway, and Google Summer of Code (see our 2015 report).[8]

Although there is no Italian capture station, a review is underway by Italian scholars to determine whether one can be established. The availability of Italian data would be useful not only for researchers but also for students. As the Red Hen site reports:

> Red Hen encourages college and high-school students to do research in Red Hen Lab. The site offers examples of even High School Research in the Red Hen Lab. If you are interested in doing a student research project in the Red Hen Lab from a remote location, contact one of the co-directors, Francis Steen or Mark Turner[9].

As far as collaboration is concerned, on the official website of the consortium, it is possible to find several opportunities for collaboration listed on the Red Hen site, and many others are in progress but not yet documented on that site. Some examples include:

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[5] https://tla.mpi.nl/tools/tla-tools/elan/, [access date: 23/07/2016].
[6] http://www.redhenlab.org/home/profiles-of-red-hen-participants/how-to-set-up-a-red-hen-capture-station, [access date: 23/07/2016].
[7] http://www.redhenlab.org/home/profiles-of-red-n-participants/how-to-set-up-a-red-hen-capture-station, [access date: 23/07/2016].
[8] https://sites.google.com/site/distributedlittleredhen/home, [access date:23/07/2016]
[9] https://sites.google.com/site/distributedlittleredhen/home/profiles-of-red-hen-participants/what-kind-of-red-hen-are-you, [access date:23/07/2016].

**Television capture**. An important way in which you may contribute to the Red Hen Lab is to set up a capture machine in your native state and country, thus adding a new and valuable dimension of new audiovisual programming to the archive. We have a streamlined system for this purpose, and the co-directors can advise, consult, and guide the establishment of capture machines.

**Feature tagging**. If your research project is looking for the presence of a particular set of features in the news, such as structure, patterns, gestures, images, or expressions, you can contribute by doing the work of adding tags to news programs. Our web-based tagging interface allows you and any assistants to tag news stories for a broad range of features. If the tagging scheme you need is already present, use it; if it is not, propose a new scheme to us (see example below). We will implement your scheme on the condition that you then populate the scheme with a hundred or so tags, so that others would have an example of how to use the scheme.

**Tasks and datasets.** Contribute to Red Hen by solving tasks posted in our Barnyard, or by adding new tasks, as in Speech Gestures in Art, or by contributing new datasets for manual analysis and machine learning, such as Interesting co-speech gestures. When uploading images and documents, please use our File Cabinet an link to your file.

**Natural language analysis**. Do you have NLP expertise? We are interested in parts of speech analysis, sentiment analysis, and other features, and can offer a vast dataset of around three billion words to play with. See also Projects for students.

**Multimodal parsing tools**. The Red Hen team already includes groups working on image / text parsing. We are particularly interested in contributors familiar with audio parsing. You could develop modules that examine voice, music, and other sounds present in the news recordings.

**Statistical analysis**. If you or your team has skills in statistics, could you develop an R script or package that can ingest material from the Red Hen dataset and generate various forms of statistical analysis?

**Visualization tools.** Could you design methods of providing visualizations of search engine results or the output of the statistical analysis? Specifically, we are interested in D3 implementations, since our framework already incorporates D3, a powerful and flexible toolkit.

**Tutorials and Educational Resources**. Red Hen offers many of these already, all of which can benefit from improvement and continued management and maintenance, and further resources could be added. For example, the Edge Search Engine and the command line both offer utilities for searching for regular expressions, but we have only a simple introduction to this functionality. A full tutorial on what regex expressions work in the Edge Search Engine and from the command line could include an open-ended library of example code.

**Pedagogy and management**. New "red hens" could pick up responsibilities for managing projects. For example, excellent seniors in high school have an interest in doing their senior projects in the Red Hen because it offers them something otherwise impossible: Actual participation inside a major research program. A new "red hen" might be tutored by the co-directors in how to run such a program for high school seniors, and run it, on the understanding that the students would provide electronic presentations. A library of such crowd-sourced research could serve as a tool for teaching and as a collection of examples for other high school "red hens"[10].

The Red Hen involves many kinds of research and many disciplines: linguistics, gesture study, social cognition, natural language processing, machine learning, computer vision, the study of

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[10] Ivi.

narrative and story, analysis of individual differences in communication, political science, cultural differences, and so on. It is certainly a transdisciplinary project: «Red Hen is a co-operative of engaged researchers who collaborate closely and contribute power and content to Red Hen and hence to each other and to future researchers»[11].

Red Hen is paving the way for cognitive scientific analysis of multimodal communication. Thanks to several instruments, computer and information science provide formidable contribution to this study. Red Hen Lab is one of the most dynamic labs in multimodal communication, and it offers possibilities for all scholars who want to contribute to the consortium and, accordingly, participate in the development of this scientific field.

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Web resources

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[11] http://www.redhenlab.org/ [access date:23/07/2016]