



Video-based Research in Education

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Using Studiocode to Collect, Manage and Analyse Video Data

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Aim of Research

- Exploring the use of digital representations (Net Logo) by students to reason about natural selection (as a complex systems phenomenon) with the goal of characterising this reasoning.
- What does Net Logo offer (as digital technology) in terms of teaching and learning about natural selection and how can this potential be fully utilized by teachers & students?



Design

- Pilot study
 - Computer session (50 mins) run as a part of a one day workshop on evolution
 - Exploring natural selection by investigating Darwin's finches (in Net Logo models)
 - Answer questions through a process of guided inquiry and group work
 - 6 students & 1 teacher from a metropolitan government school
 - 8 students & 1 teacher from a regional government school
 - Students in year ten & year eleven (16-17 years)

- Full study
 - Computer session (90 mins) run as a part of a one day workshop on evolution
 - Exploring natural selection by exploring the interaction between malaria & the HBB gene (in Net Logo models)
 - Interact with, create & record representations through a process of guided inquiry & group work using Explain Everything
 - 22 students & 2 teachers from a metropolitan, co-ed government school
 - 25 students & 2 teachers from a metropolitan, all male government school
 - Students in year ten (16 years)



Net Logo as a Digital Representation

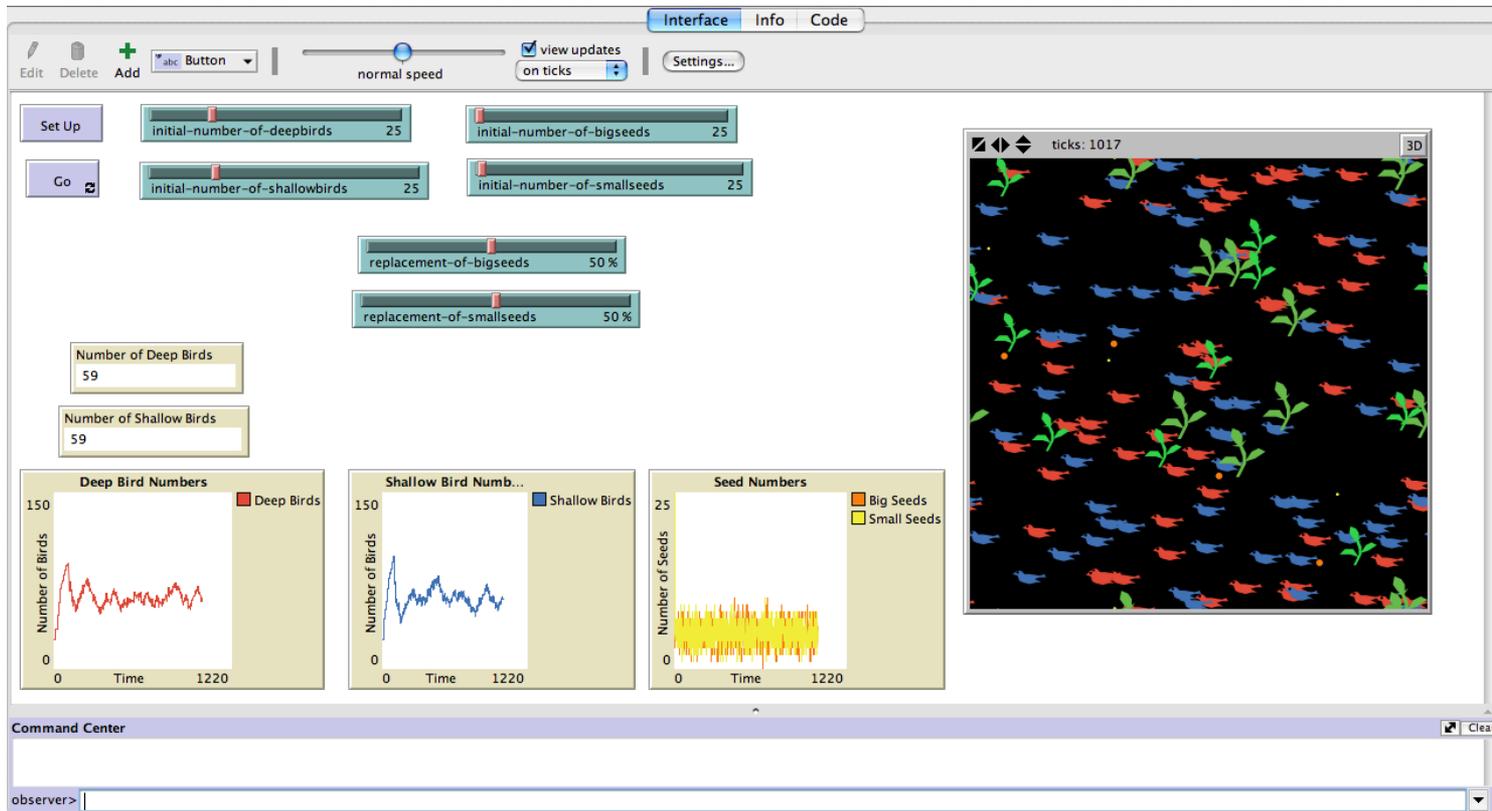
- Key features
 - Low-threshold & high-ceiling (easier to understand than similar software)
 - An agent perspective for simulating large-scale & complex systems (provides a natural descriptive focus)
 - An animated environment showing the interactions, births & deaths of agents
 - Controls to stop/advance time & modify the behavior of models while they run
 - Visualizes emergence & macroscopic adaptation to variation in low-level control
 - Supports hypothesis & experimentation with running models



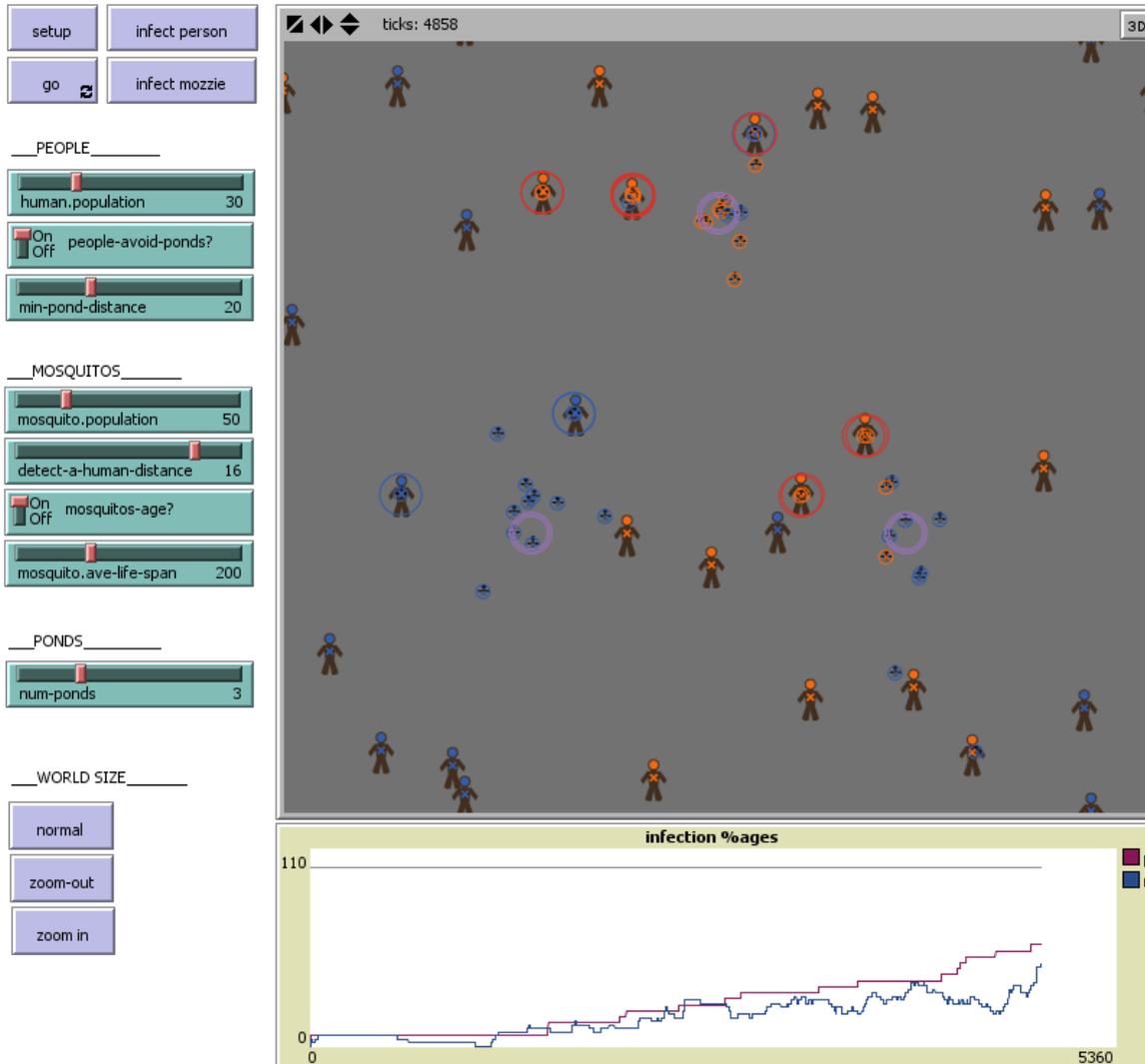


Darwin's Finches Population Model

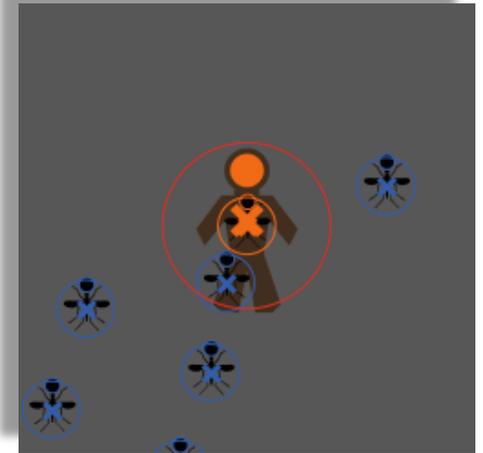
A model showing the changing make up of the finch population under changing ecological conditions



Human-Mosquito Interaction Model



A fine detail model showing the interactions between humans, mosquitos & the malaria parasites





Human-Mosquito Population Model

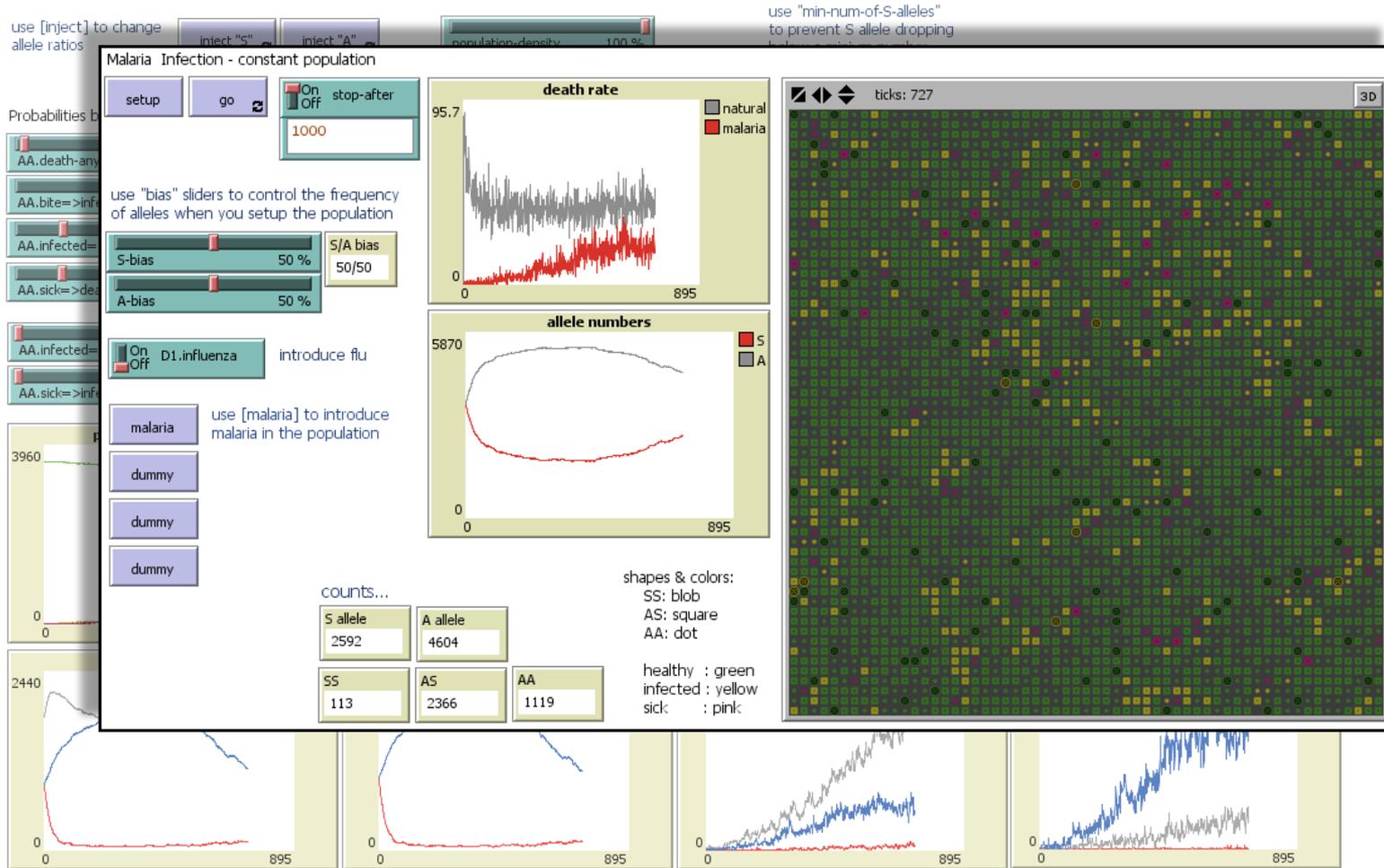


A model showing how interdependent populations of humans & mosquitos fluctuate under different ecological conditions



Genetic Spread in Human Population Model

A model showing the changing make up of human population under different ecological conditions





Evolution in the Blood at GTAC

<http://www.gtac.edu.au/teacher/programs/evolution-in-the-blood-at-gtac/>



Aim of Research

- Exploring the use of digital representations (Net Logo) by students to reason about natural selection (as a complex systems phenomenon) with the goal of characterising this reasoning.

- What does Net Logo offer (as digital technology) in terms of teaching and learning about natural selection and how can this potential be fully utilized by teachers & students?

- What data is required to achieve this goal? How will this data be collected and managed? How will this data be productively analysed?

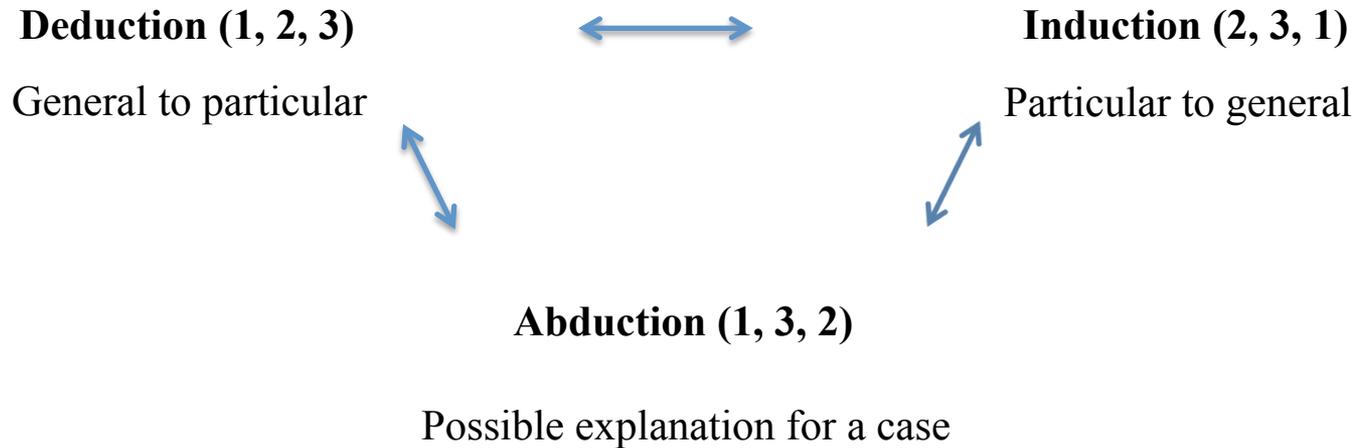


The Suitability of Using Video Data

- Provides the opportunity to capture the unfolding of reasoning (in this case abduction) as it takes place.
- Difficult to capture reasoning in the static form (e.g. in writing, drawings etc.).
- Reasoning does not only take place in a systematic, propositional form in the head, rather reasoning is also visual and action based (i.e. manipulative).



Magnani's Abductive Framework



1. If a patient is affected by pneumonia, his/her level of white blood cells is increased.
2. John is affected by pneumonia.
3. John's level of white blood cells is increased.⁴

(Magnani, 2005, p. 269)



Magnani's Abductive Framework

Selective

- “...abduction that merely selects from an encyclopedia of pre-stored hypotheses...” (Magnani, 2009, p. 27)

Creative

- “...abduction that generates new hypotheses...” (Magnani, 2009, p. 27)

Theoretical

“...only inner aspects are at stake ...” (Magnani, 2009, p.12)

Manipulative (extra-theoretical)

“...the interplay between internal and external aspects is fundamental...” (Magnani, 2009, p.12)

“...thinking through doing...” (Magnani, 2009, p.2)

“...a kind of abduction, usually model based and so intrinsically “iconic”, that exploits external models endowed with delegated (and often implicit) cognitive and semiotic roles and attributes. ...” (Magnani, 2009, p.58)



Abduction

Theoretical



Sentential



Model-Based



Visual

- “...related to logic and to verbal/ symbolic inferences...” (Magnani, 2009, p.11)

- “...related to the exploitation of internalized models of diagrams, pictures, etc.” (Magnani, 2009, p. 12)

- “...a special form of non verbal abduction, occurs when hypotheses are instantly derived from a stored series of previous similar experiences. It covers a mental procedure that tapers into a non-inferential one, and falls into the category called ‘perception’.” (Magnani, 2009, p. 35)



The Requirements to Use Video Data

- Collect video data (i.e. film, capturing audio and video).
- Manage the video data once it is collected.
- Analyse the video data.



Studiocode

- Developed for use in sport.
- Beginning to be used as a method to identify and code data in diverse areas, including educational contexts.
- Tag relevant events (along a timeline) that occur in videos (it is video tagging software).
- Can be used to capture, manage and analyse (to a certain degree) video data.



Using Studiocode to Capture Video Data



Imported

on screen & off
screen



Studiocode

Directly
recorded

- Capture video data directly into Studiocode.
- Import existing video data into Studiocode.



Using Studiocode to Capture Video Data

- In most instances cannot capture everything on film, so how determine what to record?
- Who makes the decisions as to what is recorded (researcher, camera operator)?



Using Studiocode to Manage Video Data

- Once video data is present within Studiocode (either through direct recording or via importing) then must prepare the video for analysis (it must be managed!)
- Often audio is not synchronised with video and this must be fixed. This can be done in Studiocode by ‘nudging’ the audio up and down on the video timeline. Can also mute selected audio sources.
- If working with multiple video data sources then must integrate them (so that can view the same event from different perspectives). This can be done in Studiocode by ‘stacking’ videos such that different video sources run side-by-side (but the videos must be synchronised!)
- Must remember, however, that the initial recording of the video data determines the quality of the video and audio (this cannot be improved in Studiocode!)



Using Studiocode to Manage Video Data

- What impact does this ‘management’ of the video data have on the data and on the eventual analysis?
- How determine the extent to which manipulate the video data? Leave it as close to original recording as possible or alter so that can best pursue the research goals?



Using Studiocode to Analyse Video Data

- Studiocode does not analyse the video data for you! What you get out of the software is entirely determined by what you put in.
- Studiocode enables the video data to be ‘played’ with in such a way that analysis becomes possible (the video data is converted into a more manageable form).
- But Studiocode does reveal patterns in video data in a way that is visually striking (and potentially very useful).



Using Studiocode to Analyse Video Data

- The tagging of events in video timeline is determined by the ‘categories’ and ‘labels’ that are selected. These categories and labels are entirely determined by the researcher (must be informed by the literature/research).
- The ‘coding’ window determines the segmentation of the video timeline (into ‘instances’) and is made up of the categories with the labels further characterising the categories.
- Use ‘transcription’ window to provide more detail (e.g. transcription of dialogue).
- Video timeline and instance windows present video data in different forms.
- The process of coding the video data is iterative in nature (each pass of coding the video leads to alterations of the code that is then reapplied to the video).



Using Studiocode to Analyse Video Data

- Can export data from Studiocode in different forms (e.g. ‘edit list’ for timeline or ‘transcript text’ for transcript).
- Often need to work outside of Studiocode to continue with the analysis.



Using Studiocode to Analyse Video Data

- How determine the basis for the categories and labels that segment the video timeline (into instances) and ultimately determine the analysis?
- How do you know when the code (set of categories and labels) is sufficient to lead to the desired analysis?
- How can the analysis and the processes preceding the analysis be presented for others to assess (i.e. how can the findings from video data be communicated in static forms, e.g. text in papers etc.?)



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