Novel Incentives in Language Resource Development

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Resource Gaps and Implications

- LR supply still far short of demand
  - in the average and for every human language
  - remains an impediment to HLT development (Choukri)
- MetaNet 2010 LRs->HLTs to prevent EU language digital extinction
  - no language, not even English, enjoys the full range
  - *21/30 European languages could become extinct in the digital world*
- chronic interpreter shortage in crisis zones
  - International Association of Conference Interpreters (2008)
- *"Effective communication in Haiti was confronted by language barriers and the limited utilization of technology"*
  - Harvard Humanitarian Initiative 2011
- growing need for greater translingual capability in counseling
  - American Psychological Association 2010

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HLT to the Rescue? Not without LRs

- Varma et al. (2011) used NLP to filter tweets, with 80% accuracy, according to whether they provided situational awareness.
- However, system required training data annotated
  - situational awareness
  - subjectivity
  - formality
  - personal versus impersonal viewpoint
- Processing included POS tagger generally absent from most low resource languages as are:
  - tokenizer
  - list of stop words
  - unigram and bigram frequencies
  - perhaps even the text from which to derive them

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The Dirty Secret & a Bold Prediction

- Current approaches will not come close to
  - creating full range of LRs, or even a respectable subset
  - for world's 7097 languages, or even respectable subset
  - within the foreseeable future
- not because they are inefficient (though some are)
- but because they employ a finite resource to address a nearly infinite problem.

- By implementing novel incentives we harness the renewable resources of the human drives to learn, compete, enjoy and make meaningful contributions.

Incentives Aware Model of LR Development

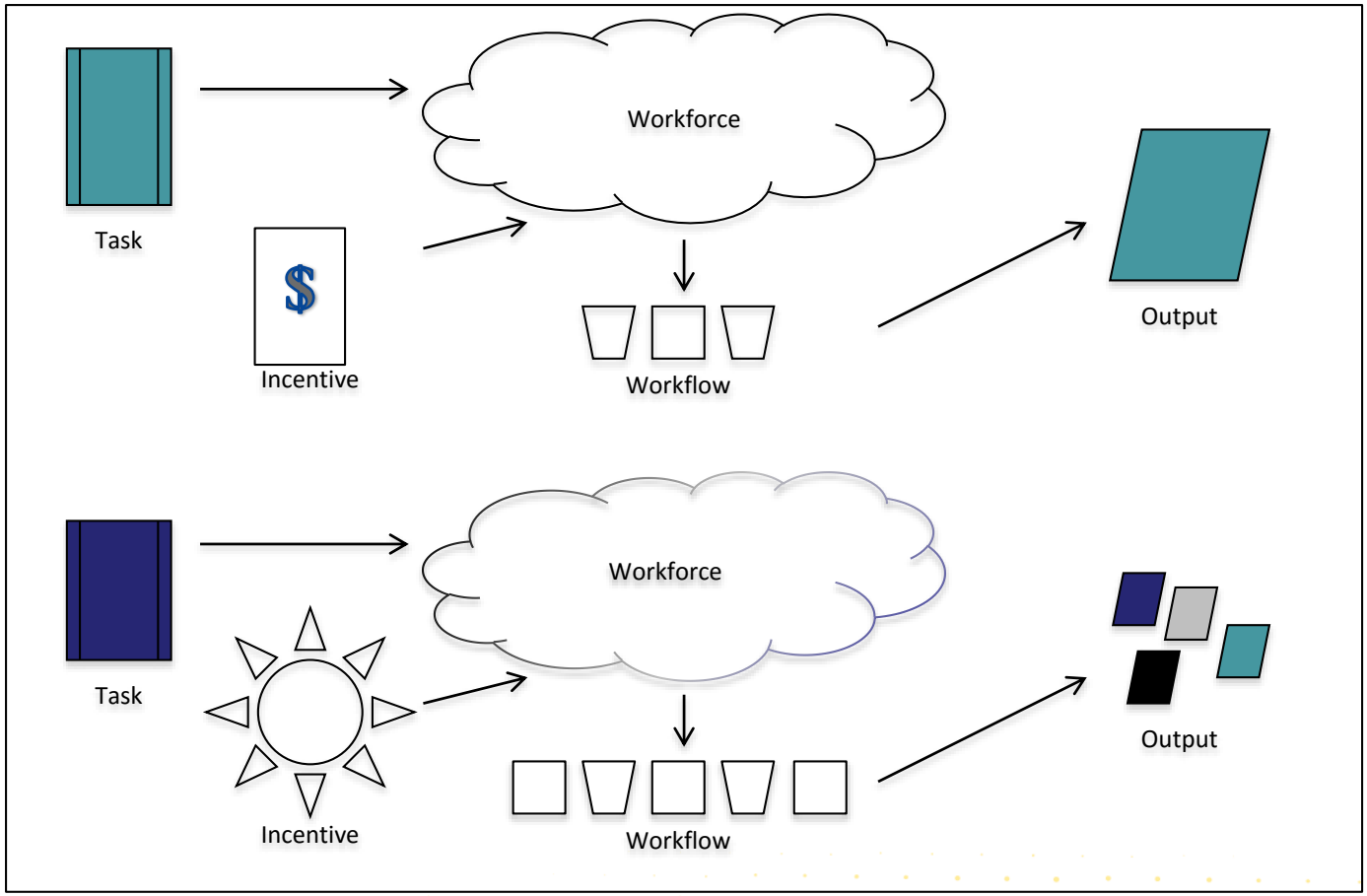

Figure 1: Different incentives attract different workforces that require different tasking and workflows and produce different outputs.

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WS: Collection

- Nick Campbell: data collections supporting development of systems capable of producing expressive speech
- experimented with multiple incentives
- adjusted to the different characteristics of the output
  - monetary compensation
  - access to resulting data for research purposes,
  - sustenance
  - curiosity
  - fun
  - ability to keep the recording device used
  - opportunities for unusual social interactions
    - apparent conversations with a robot
    - even more exotic: extended interactions with colleagues outside the lab
- acquiring some product, service can lead customers to provide vast quantities of ‘data’ to HLT researchers in industry

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WS: Collection

- Mitsuzawa et al. process product/company reviews
- industrial developers = reduced train-test mismatch
- Incentives
  - communicate dissatisfaction
  - points that convert into monetary value, based on volume, quality
- mixture of incentives yields variation in data

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WS: Annotation

- Greenfield, Chan, Campbell experiment with crowd-sourcing annotation to support information extraction
- Incentives
  - some Turkers motivated by quality of the interface
  - desire to maintain a high approval rating
  - as well as the monetary incentives
- By focusing on interface design they elicit higher quality data while avoiding pernicious problems common in Mturk

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WS: Annotation

- Poesio et al. describe Phrase Detectives
- GWAP for collecting anaphora annotation
- Incentives
  - entertainment
  - interesting source material
  - variable point system
  - opportunity to progress through experience levels,
  - leaderboards
  - social motivations of teaming with friends in FB version
  - prizes awarded via a lottery, according to performance.

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WS: Exploitation

- Tyson et al. automate link discovery among About.com texts
- Incentives
  - corporate mission of recirculating users
  - content creators different motivations => fewer links than desired
- addressed through
  - automated techniques
  - additional human annotation

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WS: Exploitation

- Eskenazi et al. describes dialog system R&D
- Incentives
  - automated access to information
  - improved customer experience in real world interactions
- challenging levels of noise, variation in speech
- extended notion of novel incentives to research community
- free access to data, system
- outreach activities
- attract researcher cycles to problems of interest to them
- “optimization for lab test subjects may not reflect the outcome with real users”.

Outside HLT

- Great Language Game (GLG)
  - contributors hear short audio clips randomly, from 80 languages
  - indicate what language is spoken
  - released corpus of 16 million judgments w/l 1 year
  - incentives
  - information
  - entertainment
  - competition
  - status
- However, not directly useful for LRE
  - relies on ability to identify correct answers
  - language know
  - each new judgment adds little information about confusability
- Developer moved on

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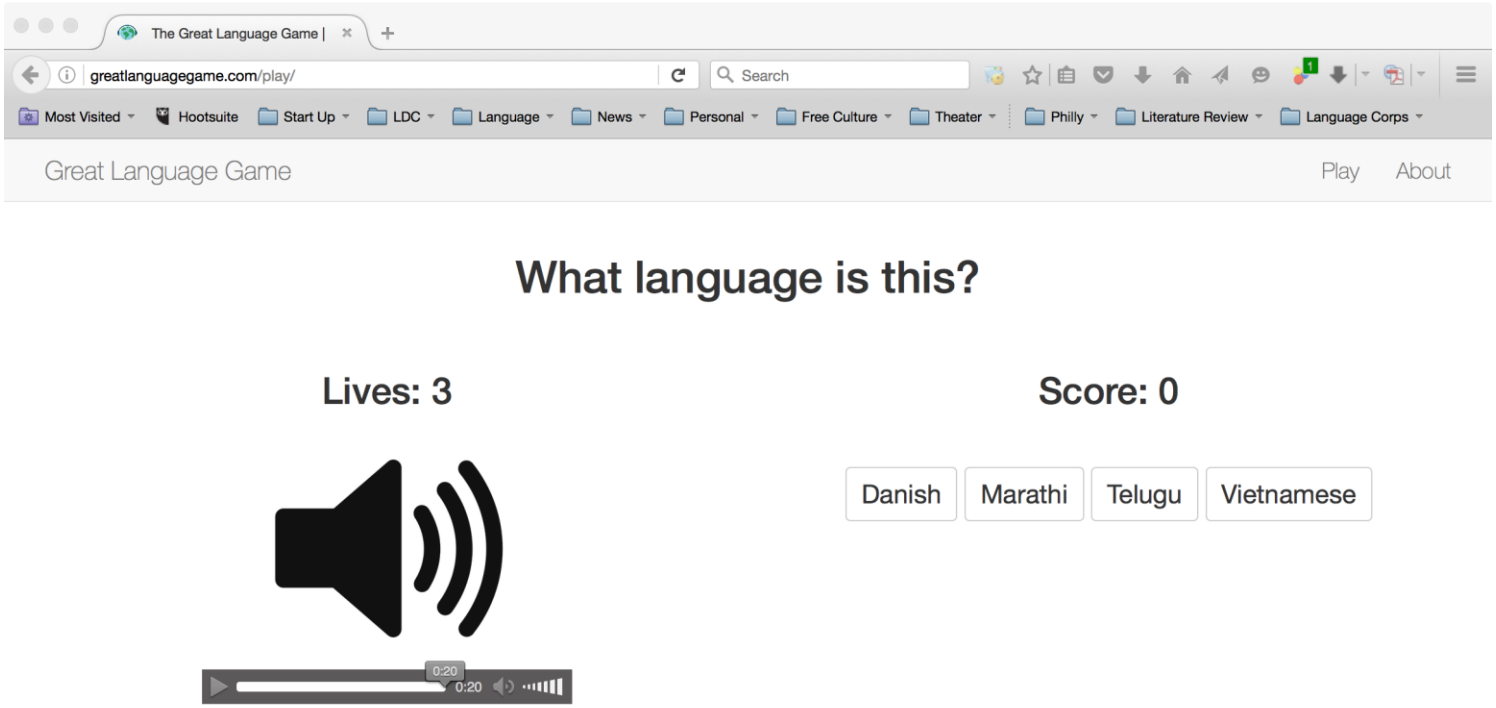
Outside HLT



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Outside HLT

- LibriVox creates “free public domain audiobooks” by recruiting, training and organizing volunteers who record themselves reading literary works out of copyright in US.
- LibriVox catalog (3/25/2016)
  - 10,185 books comprising at least, 57,369 hours of read speech
  - estimated cost to reproduce with monetary incentive: $28 million
- Incentives
  - LibriVox mission, open source, free culture movements
  - enjoy reading aloud, expanding a family activity
  - maintain the art of storytelling
  - collaborating with others of similar interests
  - ability to control the size of their own contributions
  - develop or maintain skill
  - opportunity for paid work

Outside HLT

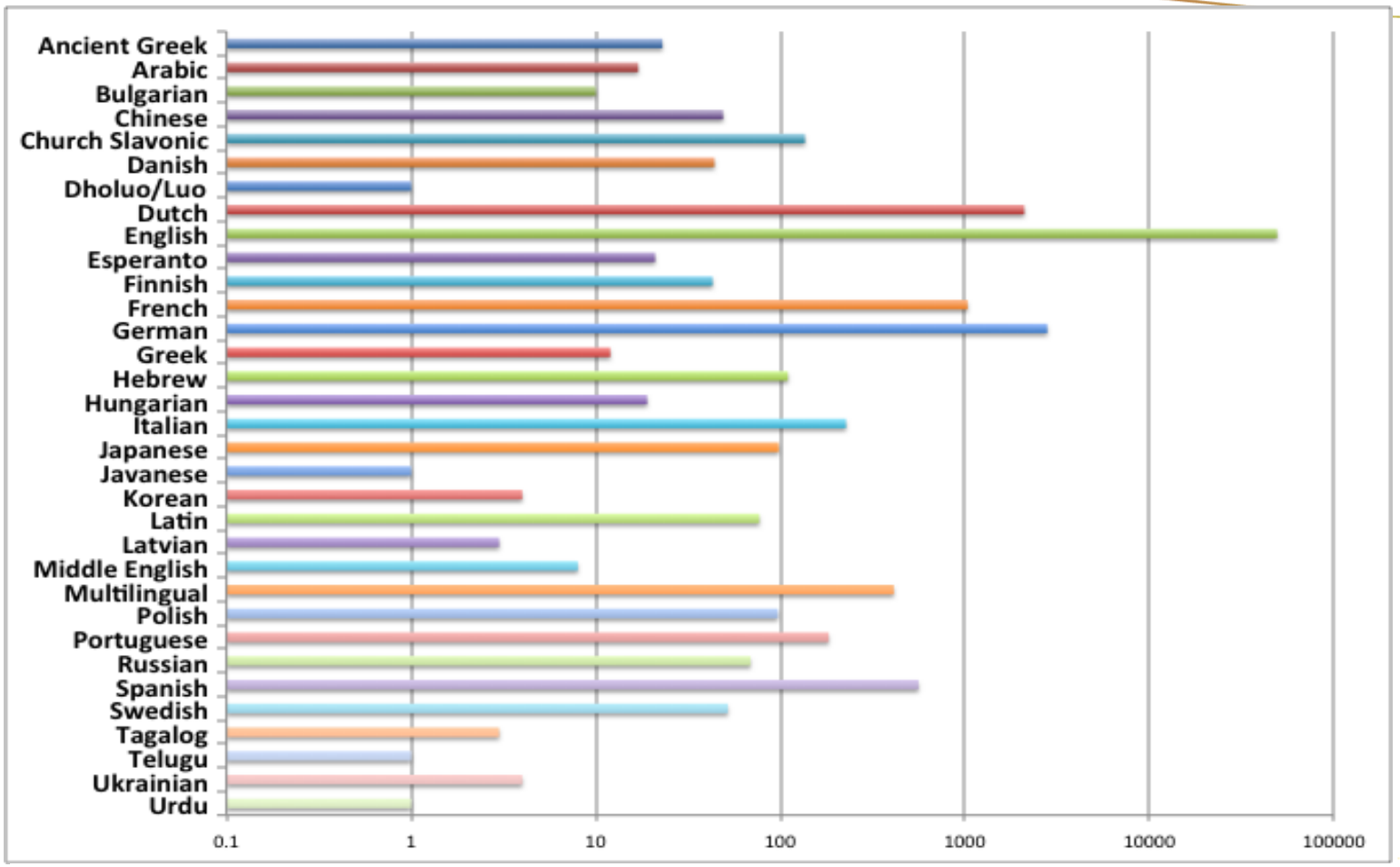

Figure 1: LibriVox Hours Recorded per Language on a log(10) scale

Outside HLT

- Zooniverse citizen science portal
- Tasks include
  - identifying signs of movement in star fields
  - classifying animal species based on photographs
  - transcribing museum records for insect specimen collections
- Incentives
  - contribute to research most of which is in the hard sciences
  - beautiful interfaces attract participants
  - fine grained tasking, complete meaningful tasks in minutes
- 800,000 volunteers
  - contributed data to peer-reviewed publications
  - serendipitous discoveries of astronomical objects.

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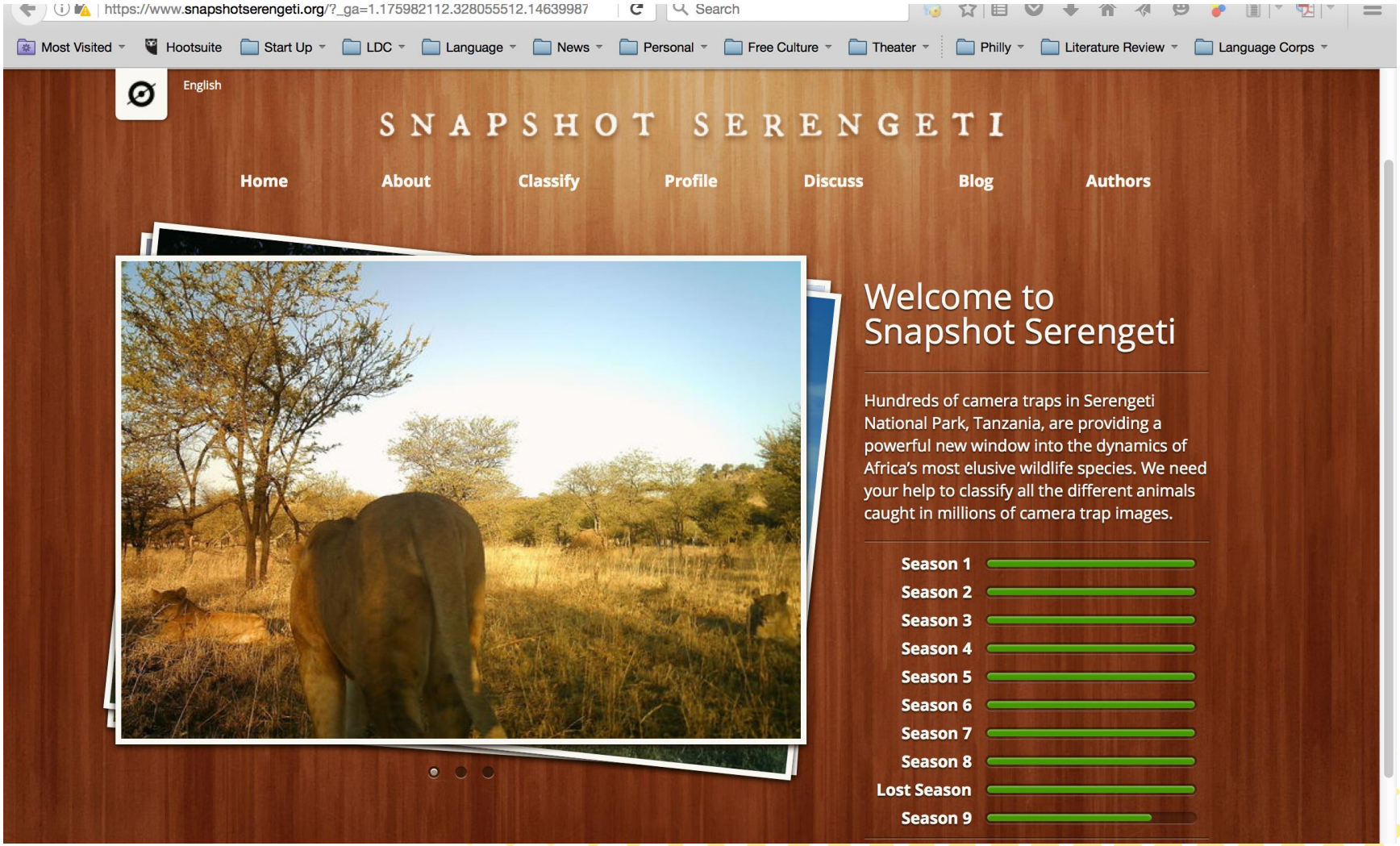
Outside HLT



Conclusion

- Novel Incentives improve our toolkit for developing LRs
- Today's papers identify the vanguard among our colleagues
- Other fields provide model, methods to consider
- Joint the discussion