

# Multimodal Summarization for people with cognitive disabilities in reading, linguistic and verbal comprehension

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## Motivation

- Cognitive disabilities are the least understood and discussed disabilities among web developers
- Some work describes how developers should make documents accessible
- Most content creators are not programmers and unaware of the accessibility guidelines

## Research Question

How can we automatically make the web contents accessible to people with cognitive disabilities?

## Principles of Cognitive Disability Accessibility

Principles of Cognitive Disability Accessibility summarized by Bohman and Anderson [1]:

- Simple
- Consistent
- Clear
- Multi-modal
- Error-tolerant
- Delay-tolerant
- Attention focusing

## Our Approach

We propose Multimodal summary of complex sentences. It gives readers the main idea of sentences using pictures and compressed text structured according to simplified text.

The general steps in the MMS approach are:

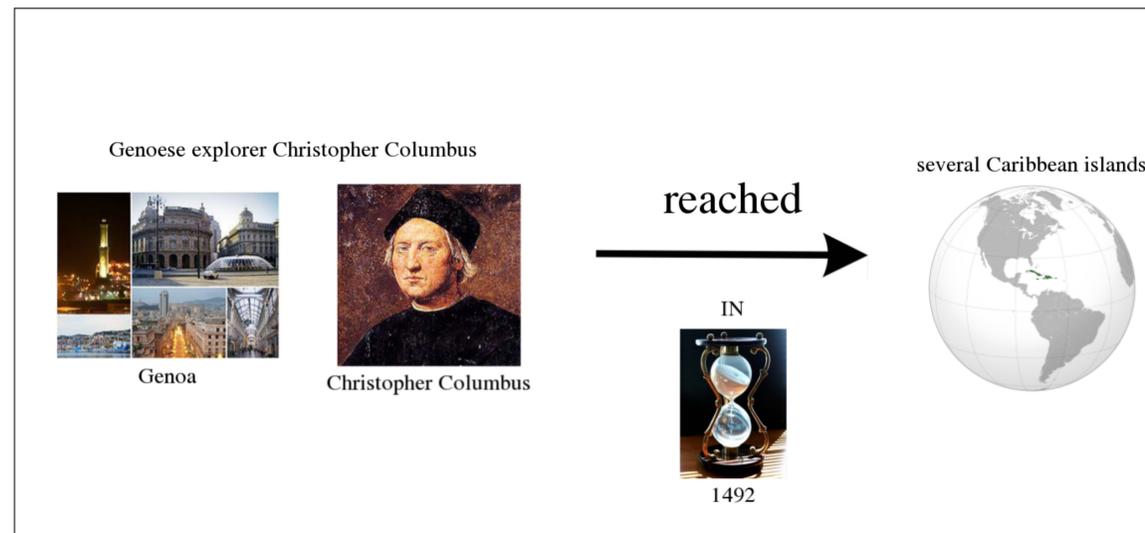
- Identify both the main idea of the sentence and related entities and use them to create a compressed summary
- Extract pictures for the compressed summary.
- Add structure to the pictures and text.

## Multi Modal Summarization (MMS)

Input sentence: *In 1492, Genoese explorer Christopher Columbus, under contract to the Spanish crown, reached several Caribbean islands, making first contact with the indigenous people.*

Identify **event** and related **entities**: *In 1492, Genoese explorer Christopher Columbus, under contract to the Spanish crown, **reached** several Caribbean islands, making first contact with the indigenous people.*

Extract picture and add structure:



## What MMS gives us?

- *Identifies main event*: Summarizes the main idea
- *Identifies related entities of main event*: Extracts main concepts, entities
- *Extracts pictures for the entities*: Gives pictorial representation
- *Represents in Subject -> Verb (Preposition) -> Object form*: Represents in simple sentence structure
- *Keeping both picture and compressed text*: Helps to process the concept using two medium, making it easy to understand and remember

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## How MMS could benefit people with Cognitive Disability?

- Simple sentence structure
- Consistent structure
- Clear subject, verb (preposition), object representation
- Multi-modal illustration and text
- Attention focusing illustration

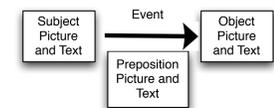


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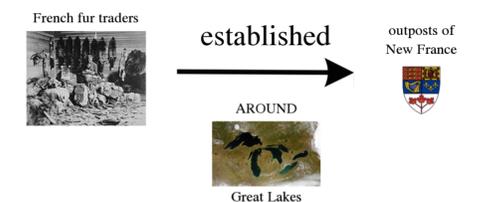
<http://www.cs.rochester.edu>

## Methodology

- Identify main idea (event) of the sentence and related entities
  - Event extraction (trained on TimeBank corpus)
  - From dependency parse of the sentence, get main event's related entities: subject (nominal subject - nsubj, agent), object (direct/indirect object - dobj/iobj, passive nominal subject - nsubjpass) and other dependencies (prepositions).
- Extract pictures for the compressed summary
  - For the entities extract pictures from wikipedia using yahoo search
- Add structure to the pictures and text



- Example sentence: French fur traders established outposts of New France around the Great Lakes; France eventually claimed much of the North American interior, down to the Gulf of Mexico.



## Comments

- We found MMS diagrams are easier for people to understand than only illustration
- We hypothesize that MMS could be useful
- We want to explore how beneficial MMS can be for people with cognitive disability

## References

- [1] P. R. Bohman and S. Anderson, A conceptual framework for accessibility tools to benefit users with cognitive disabilities, Proceedings of the 2005 International Cross-Disciplinary Workshop on Web Accessibility, 2005.