The SpokenMedia Project:
Toward Rich Media Notebooks for Teaching and Learning

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Why are we doing this?

MIT OCW 8.01: Professor Lewin puts his life on the line in Lecture 11 by demonstrating his faith in the Conservation of Mechanical Energy.

- More & more videos on the Web
  - Universities recording course **lectures**
  - **Students** (and universities) **relying** upon Web video for **learning**

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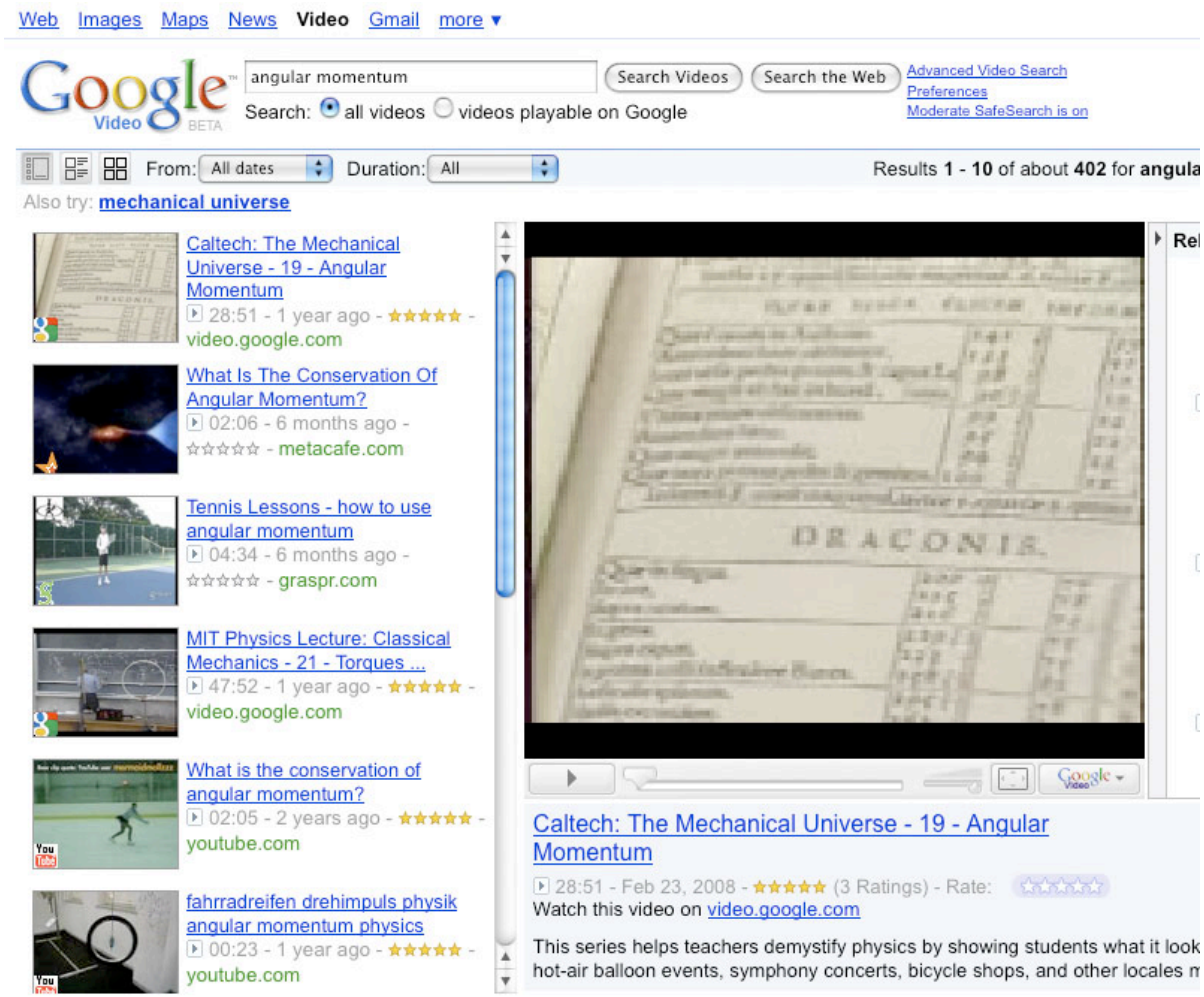
What are the challenges?

- Search
  - Volume
  - Segmented by Web, Video
  - Text title and Description



Google Search for "angular momentum" Performed April 2009

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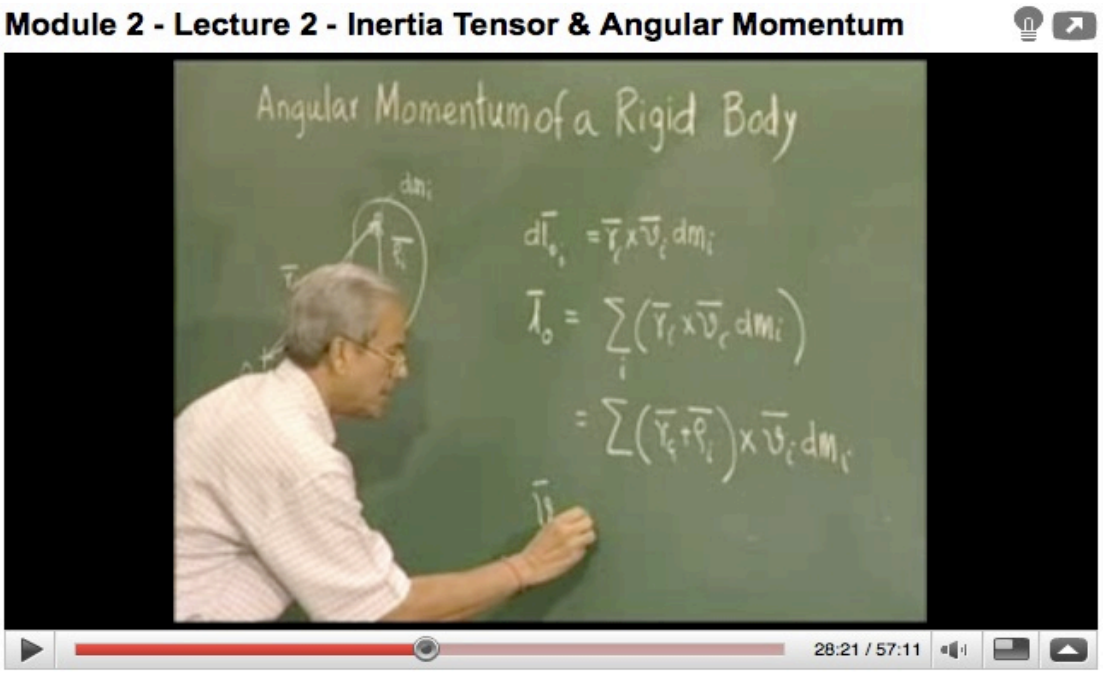
What are the challenges?

- Interaction & Use
  - Full Video
  - Transcript or Captioning



Ghosh, A. (2008). Module 2–Lecture 2–Inertia Tensor & Angular Momentum. Retrieved August 1, 2009 from YouTube Website: http://www.youtube.com/watch?v=a9n2Ztp1Oic

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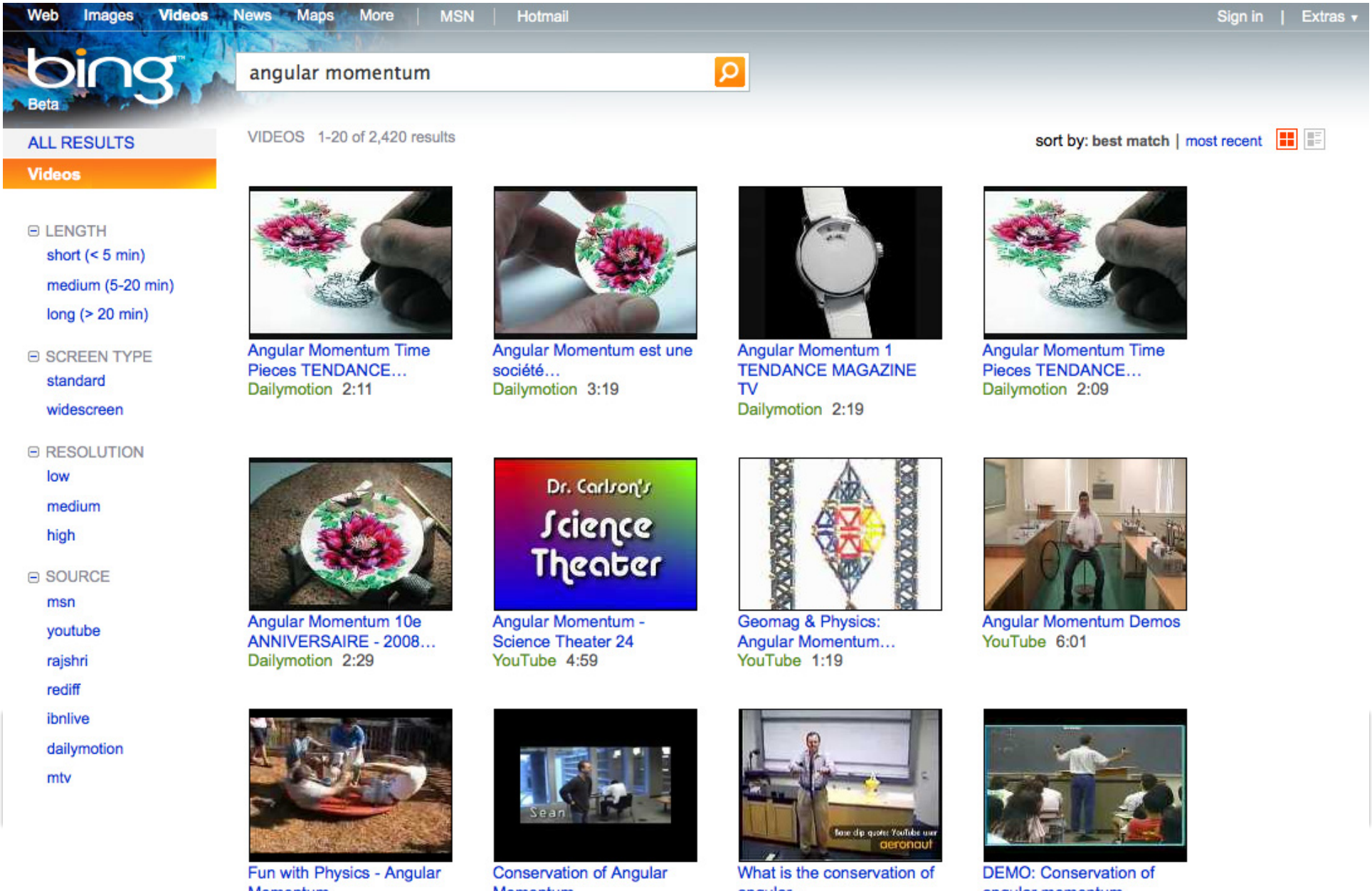
What about Bing?

Bing Search for “angular momentum” Performed August 2009



Why do we want these tools?
MIT OpenCourseWare Lectures

- **Improve search** and retrieval
- What do we have?
  - Existing videos & audio, new video
  - Lecture notes, slides, etc. (descriptive text)
  - Multiple videos/audio by same lecturer (scale)
  - Diverse topics/disciplines
- **Improve** presentation and **user experience**
- Captioning for accessibility
- Facilitate translation, other uses?

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What can we do today?

web.sls.csail.mit.edu/lectures/

- Spoken Lecture Browser
  - Requires Real Player 10

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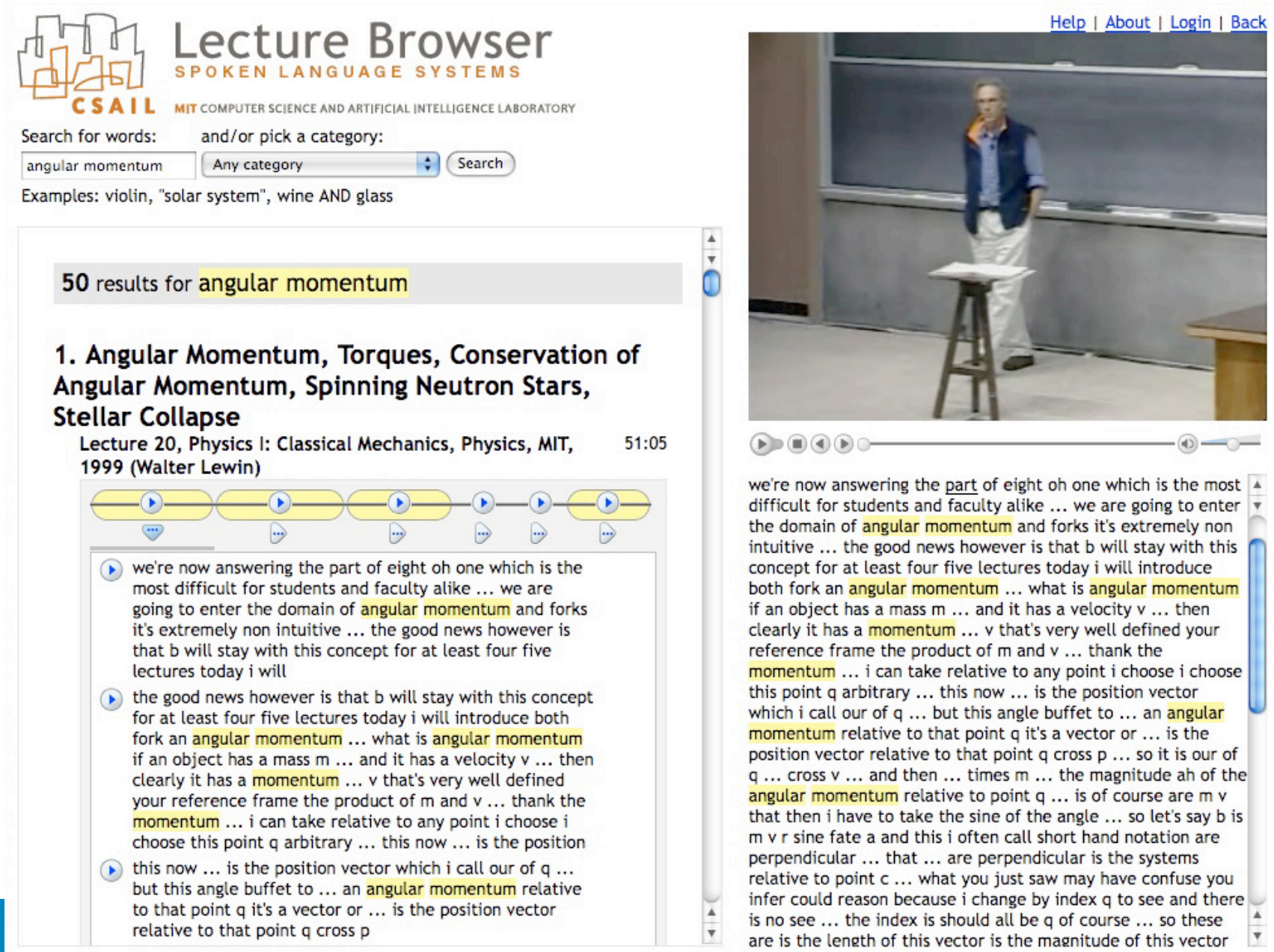

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How do we do it?
Lecture Transcription

James Glass
glass@mit.edu

- Spoken Lecture: research project
- Speech recognition & automated transcription of lectures
- Why **lectures**?
  - Conversational, spontaneous, starts/stops
  - Different from broadcast news, other types of speech recognition
  - Specialized vocabularies

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Spoken Lecture Project

James Glass
glass@mit.edu

- Processor, browser, workflow
- Prototyped with lecture & seminar video
  - MIT OCW (~300 hours, lectures)
  - MIT World (~80 hours, seminar speakers)

Supported with iCampus MIT/Microsoft Alliance funding

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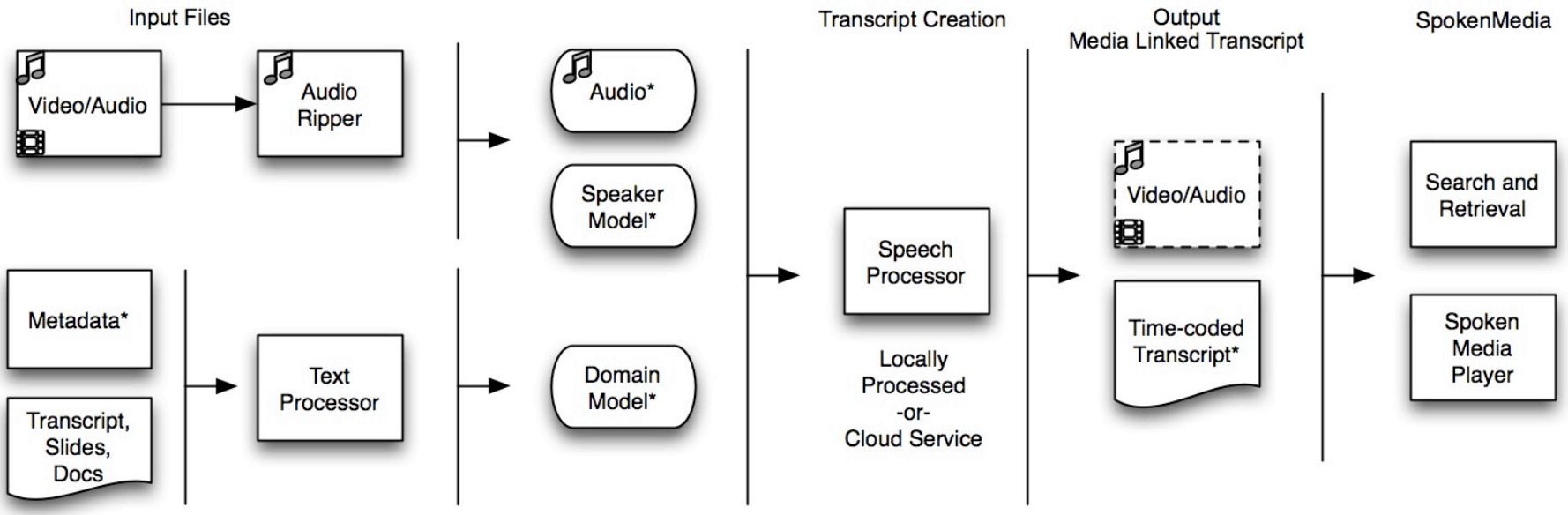
How Does it Work?
Lecture Transcription Workflow



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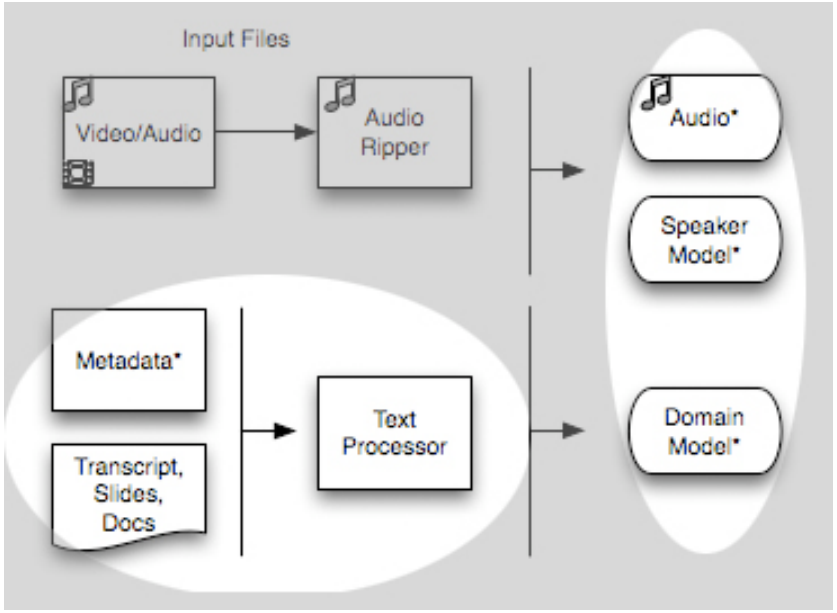
Recognizer Accuracy ~85%

- Accuracy
  - Domain Model and Speaker Model
- Transcripts
- Ongoing research by Jim Glass and his team



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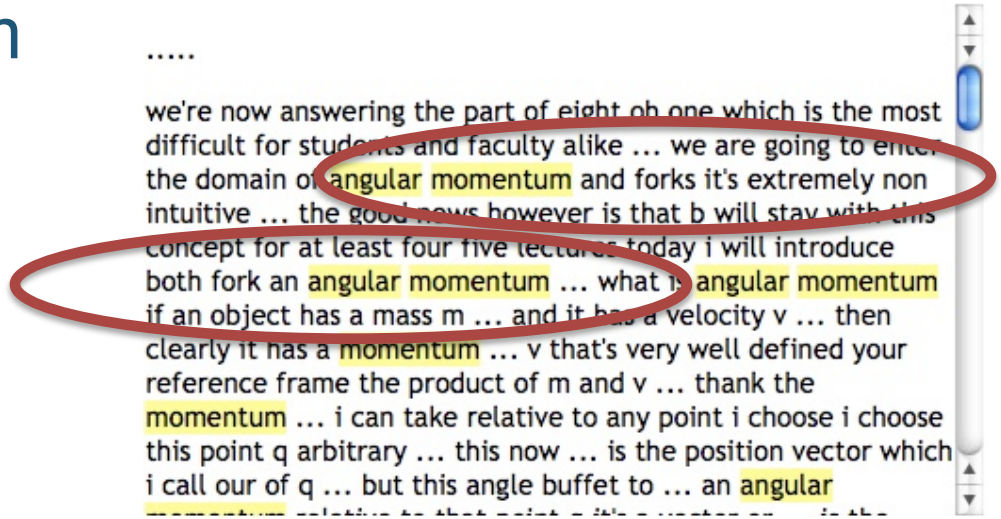
Transcript “Errors”

- “angular momentum and forks it’s extremely non intuitive”
  - “folks”?
  - “torques”?
- “introduce both fork an angular momentum”
  - “torque”!



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That's what we have today…

- Features
  - **Search** and playback
  - Segmentation of video (concept chunking)
  - Bouncing Ball follow along
  - Randomized access
- Challenges
  - Accuracy ~85%
  - Transcript errors

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Where are we heading?

- Transition to a **lecture transcription service**
- Toward **Rich Media Notebooks** to improve the user experience via Web 2.0 video interaction methods

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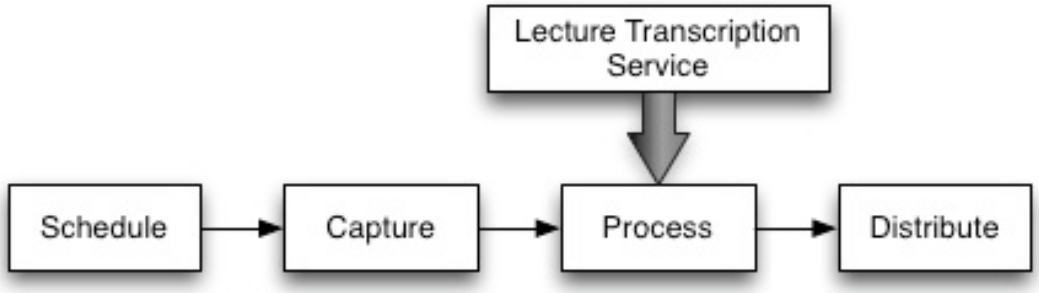
Transition: Research to Production
A Lecture Transcription Service

- Prototype **transcript production** service
  - At MIT, University of Queensland
  - Automate processes
  - Integrate with media production workflows



- Engage with **content** (video) producers to **test**
  - UC Berkeley, Harvard, etc.
  - Opencast Matterhorn

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A Lecture Transcription Service? Caveats

- Lecture-style content (technology optimized)
- Approximately 85% accuracy (probably not a full accessibility solution)
- Other languages? (not sure)
- Processing hosted at MIT (current thinking)
  - So will submit jobs via MIT-run service
  - Contribute audio extract, models, transcript for further research

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Toward Rich Media Notebooks Improving the User Experience

- Upgrade playback (Flash, H.264 encoding)
- Innovative interfaces
  - Bookmarking and annotation
  - Clip creation and authoring
- Social Editing (improve transcripts)
- Concept and semantic searching
  - Semi-automated creation of concept vocabularies

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Alternate Representations

- Microsoft Project Tuva: Enhanced Video Player
  - research.microsoft.com/apps/tools/tuva/
- MIT OCW Highlights for High School
- Look Listen Learn
  - Alternate view of MIT OCW video
  - www.looklistenlearn.info/math/mit/
- Google Audio Indexing
  - labs.google.com/gaudi
  - U.S. political coverage (2008 Elections, CSPAN)

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Microsoft Research

PROJECT TUVA

3 results angular momentum

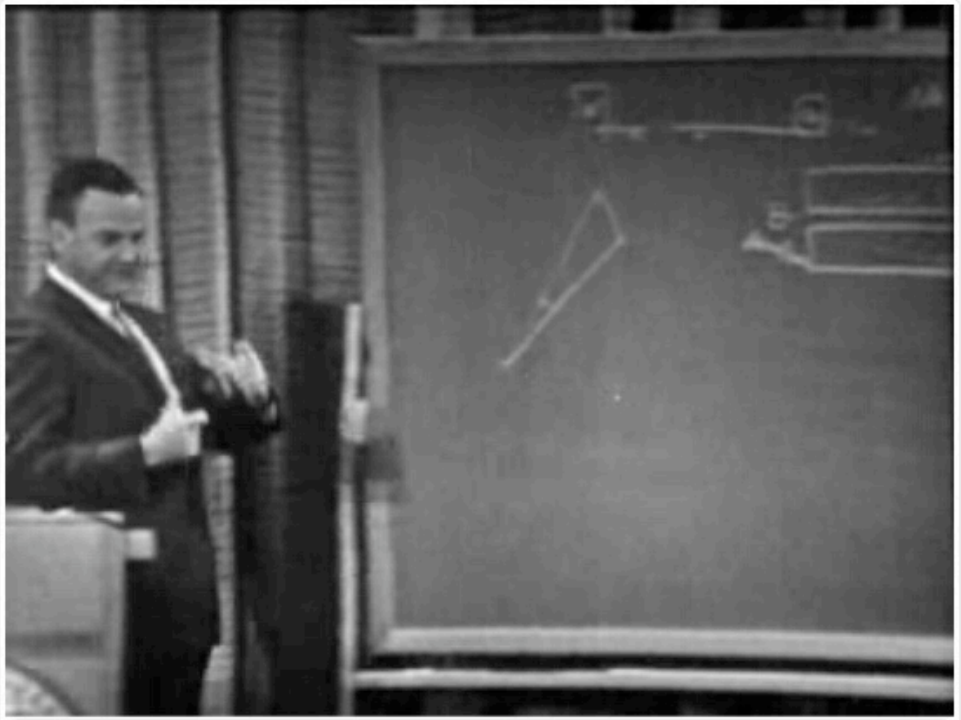
Richard Feynman: The Messenger Series: The Great Conservation Principles

NOTES | 1

44:31

Here Feynman covers Angular Momentum

Insert Note at: 45:47 0 / 150



The explanation is, that angular momentum appears in two forms:

45:47 2 3 4 5 6 7 8 9 10 11 12 56:03

Notes

research.microsoft.com/apps/tools/tuva/

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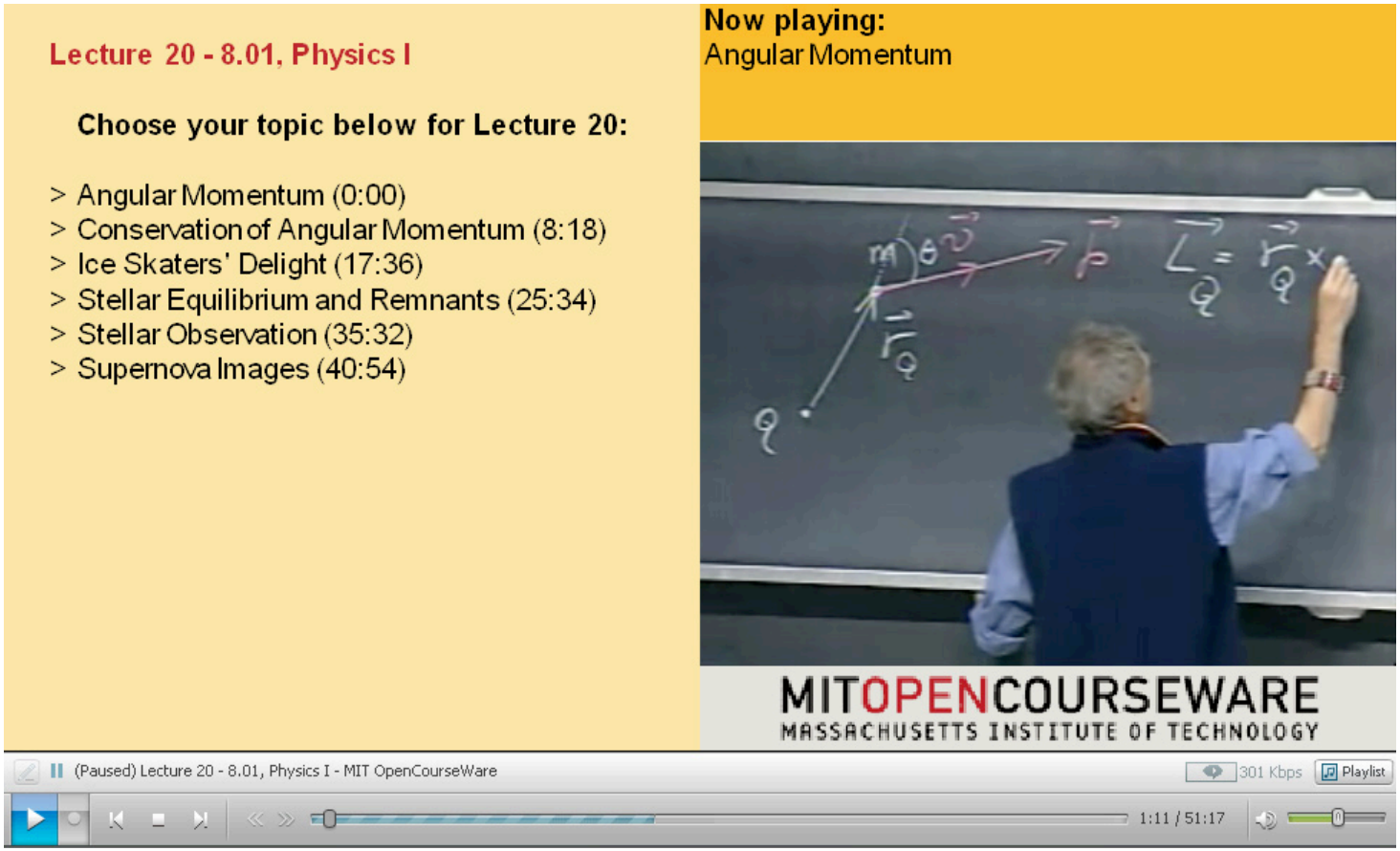
MIT OCW
Highlights for High School



http://ocw.mit.edu/ans7870/hs/physics/8.01/8.01-f99-vl20.ram

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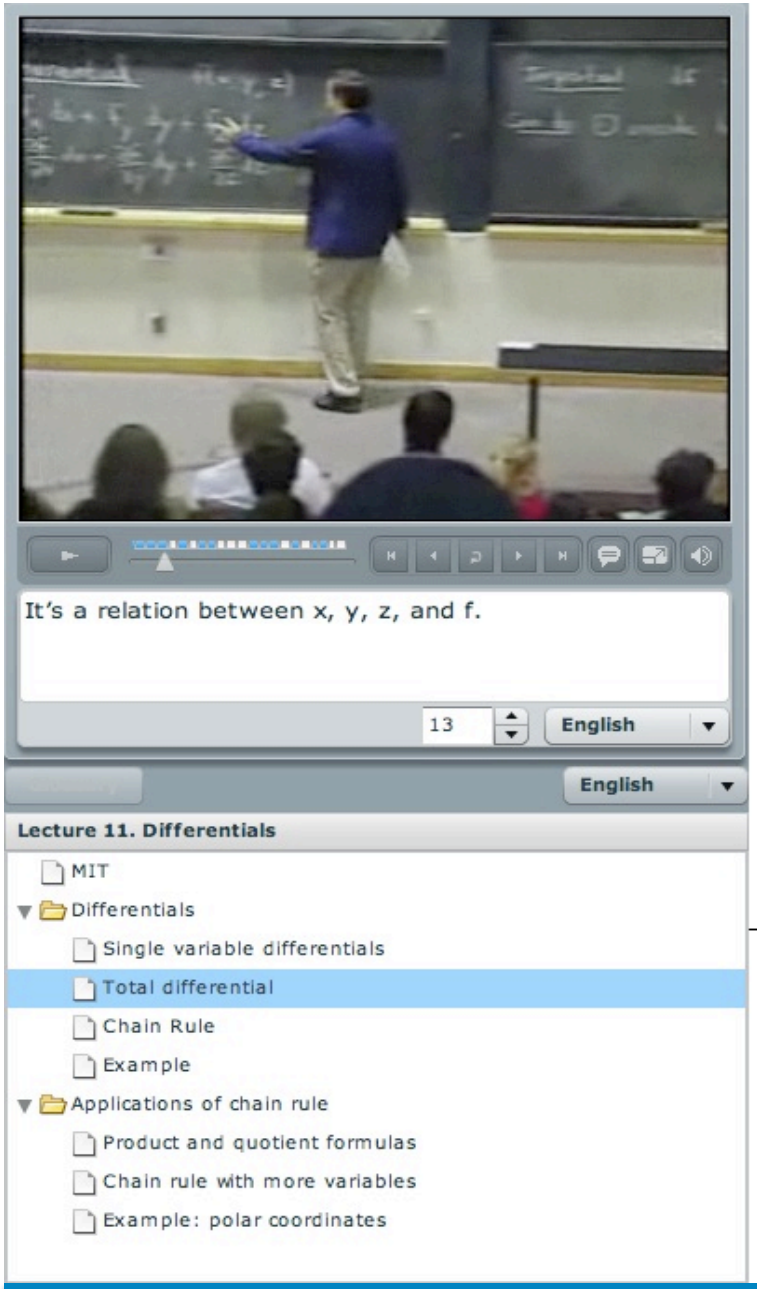

Total Differential $f(x,y,z)$

$$df = f_x\,dx + f_y\,dy + f_z\,dz$$

$$df = \frac{\partial f}{\partial x}dx + \frac{\partial f}{\partial y}dy + \frac{\partial f}{\partial z}dz$$

Important: df is NOT Δf

Can do:

1. Encode how changes in x, y, z affect f
2. Placeholder for small variations $\Delta x, \Delta y, \Delta z$ to get approx formula
   $\Delta f \approx f_x\,\Delta x + f_y\,\Delta y + f_z\,\Delta z$

www.looklistenlearn.info/math/mit/

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How We Can Turn Our Economy Around

economy | Search inside this video

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min 0 ...about where they're going to go in this **economy** and we can we know...

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