The Paperoles Project:
An analysis of paper use by music composers

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IRCAM & INRIA Futurs

Research setting

IRCAM, France

    Created by Pierre Boulez in Paris

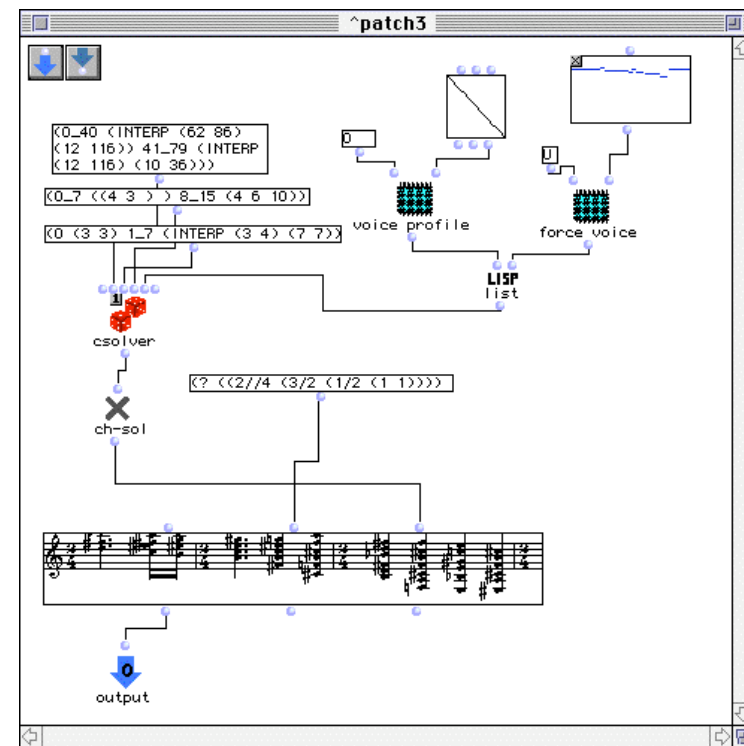   World leader in contemporary music

Rich computer environment

Highly individual creative process

Composers:

    highly skilled in both computers

    .... and paper.

Studies of composers

Interviews and observations at IRCAM

2005:   6 composers and their music assistants
Not focused on paper use

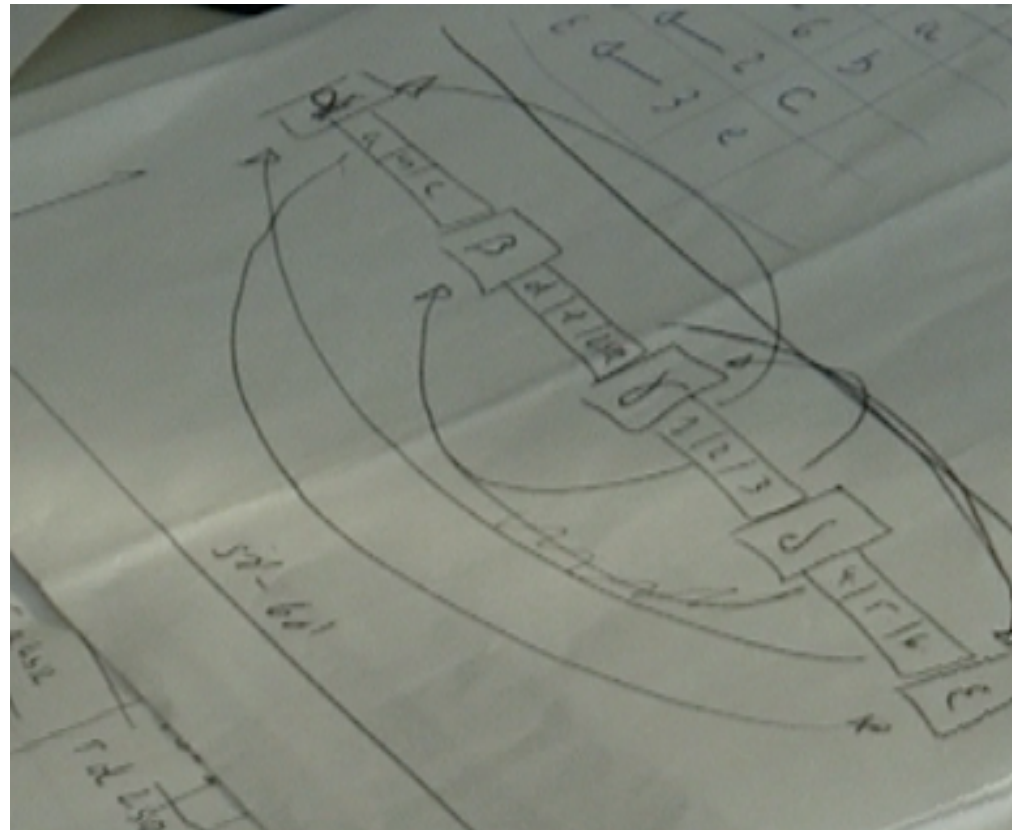2006:   2 composers
Focus on paper and potential for Anoto

Collaboration with Nicolas Donin and IRCAM's 'Practical Analysis of Music' team

2006   Longitudinal study of a complete
music composition process
Various short-term empirical studies

Results
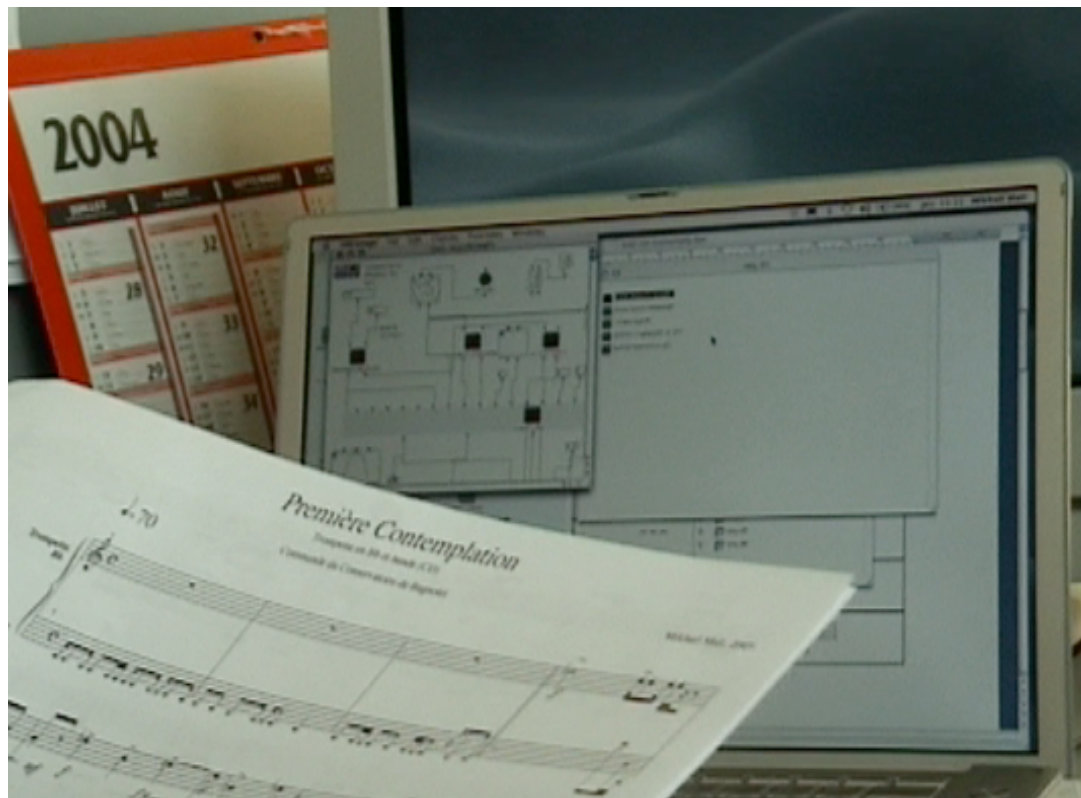
Heterogeneous support for the creative process:

Paper's open format
offers great freedom

Results

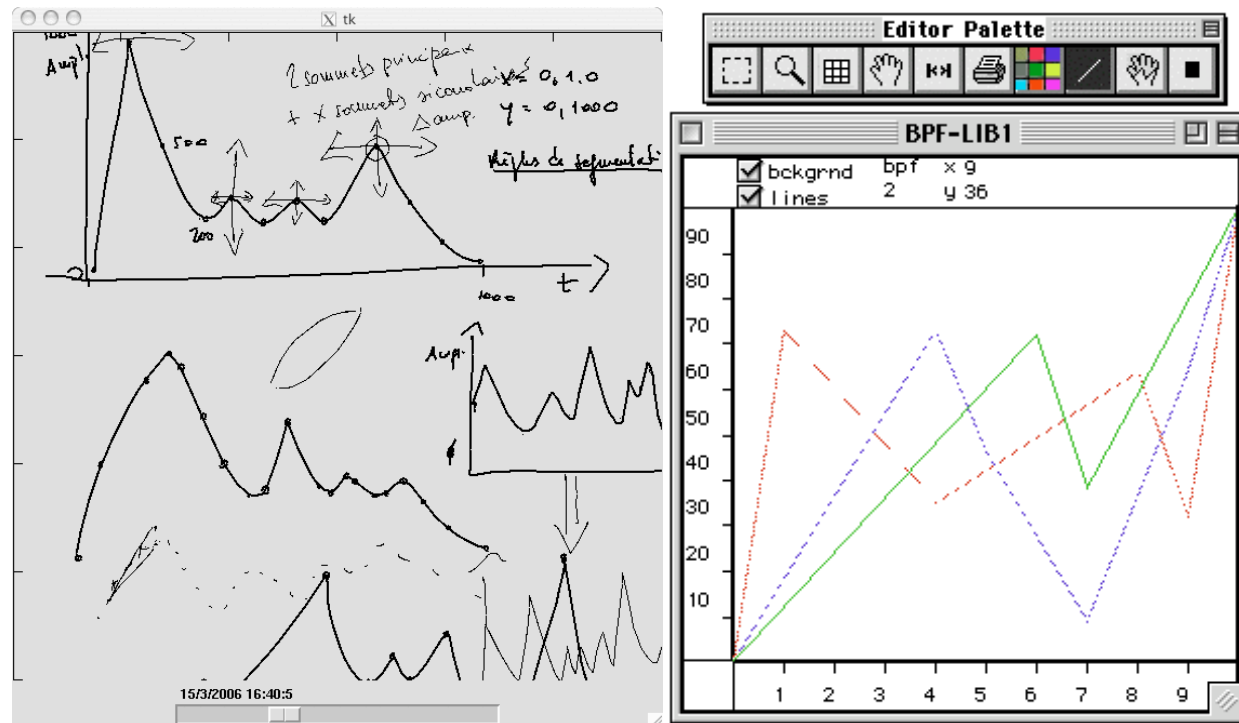Heterogeneous support for the creative process

*Discontinuities
between paper
and the computer*

Results

Heterogeneous support for the creative process

Redundancy between paper and computer

Ease of use, physical comfort

Physical relationship to paper

"A graphics tablet? You can't see what is being written under the pen, there's no sense of pressure."

Body position

"The screen is fragile, you can't press on it."

Small screen size

Too small to fit contemporary music scores
(even with an A3-size vertical screen)

Paper as a tangible object

Different paper management strategies:

Folders
 Each with different types of elements

5-sheet system
 Chords played at the piano
 Rhythmic cell and variants
 Spatial layout
 Short melodic line or preferred intervals
 Drawings for the general outline

Persistence, memory, state

Paper acts as a permanent, though sometimes *unintended*, record of the work at a given stage

Paper is easier to record or photocopy than a given state on a computer:

"To save the settings ...
I'd rather just photograph the patch!"

Time and Speed

Computers can be viewed as *too* fast,
too *variable*, *too* exploratory:

"The same, but faster, doesn't exist. As soon as an operation is fast, I tend to ignore it. I always have to go back to it, spend a bit of time and make it more complex."

"I need a "slow-motion space" for writing.

"I use the computer to compose more slowly. I waste a lot of time trying to gain space."

Representing contemporary music

How to represent
computed sounds
on paper?

Representing contemporary music

Some notes are not played, as such,

but act as statements for the computer.

Representing contemporary music

How to handle the
limits of graphical
character fonts ?
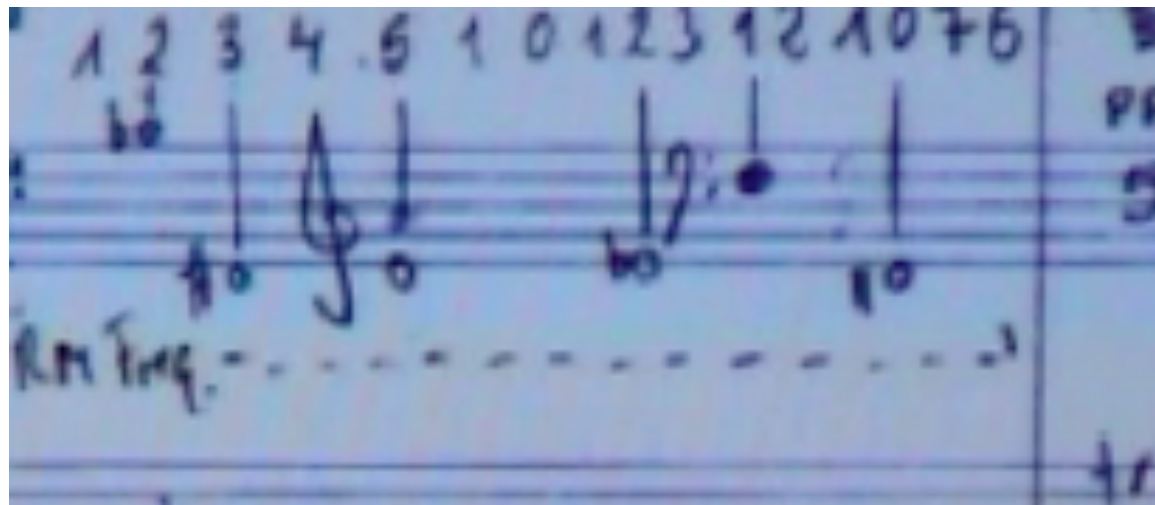
Analysis

Paper plays diverse roles through the composition process:

Paper allows free-form drawing,
>   which supports *sketching* and *reflection*

Paper is static,
>   which supports *memory* of a given state

Paper can serve as a formal document,
>   which supports creation of *official* musical artifacts.

Classical music scoresuse a universally agreed upon format
>   and notation that always works on paper.

Analysis

Computers play diverse roles through the composition process:

Computer music tools support sketching and reflection
but are less amenable to storing a final state:
You never stop - changes are always possible.

Augmented paper saves successive states:
Links between electronic and paper documents provide
a genetic trace of the whole process.

Computers do *not* serve as official musical artefacts.

Approach: Technology probes

Contemporary composers like to explore and experiment

Interaction between art and technology:
    technology is appropriated to meet an artistic goal --
    the *creation process* in part defines the *value* of the artwork

Not a process where means tend to a given and pre-defined goal:
    "For me, a score is not the transciption of an idea. Rather,
    it's a progression ... I can't separate the idea from the editing of
    the idea. There's no code of the type: 'Ah, I want to say that, like that.'"

    "I never work in the same way twice. There's never the same round-trip
    between the computer and the paper."

Augmented paper technology

Works well when paper and electronic documents co-exist
and can be combined or linked:
Sketches, drawings
Computer-based explorations
Mixed editing of scores
Annotations
Works poorly when musical representation requires a unique,
abstract or autonomous medium:
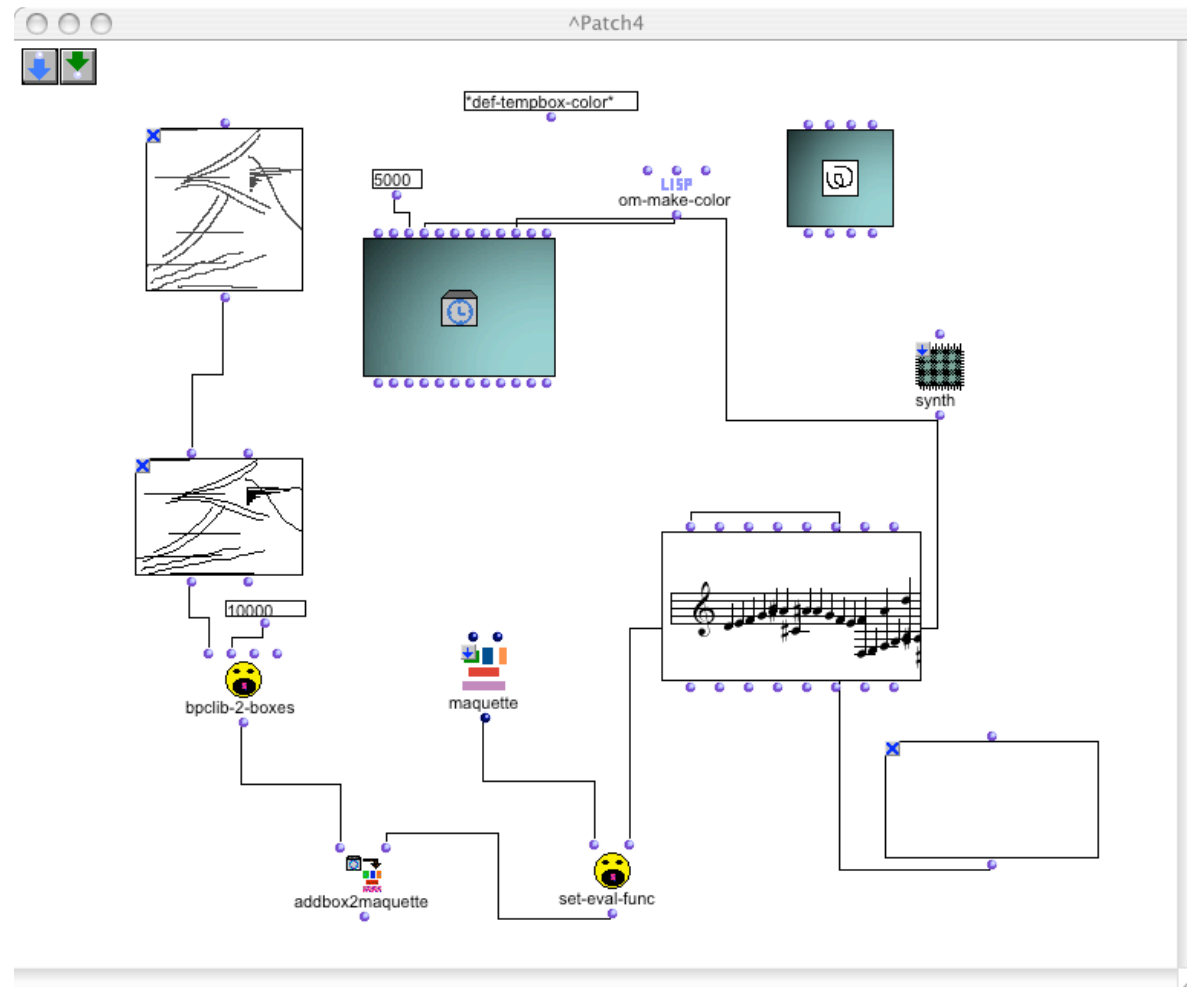Combining paper and computer does not work here

How to represent musical elements?
paper- or computer-oriented?

Musical scores require a given level of autonomy, durability and
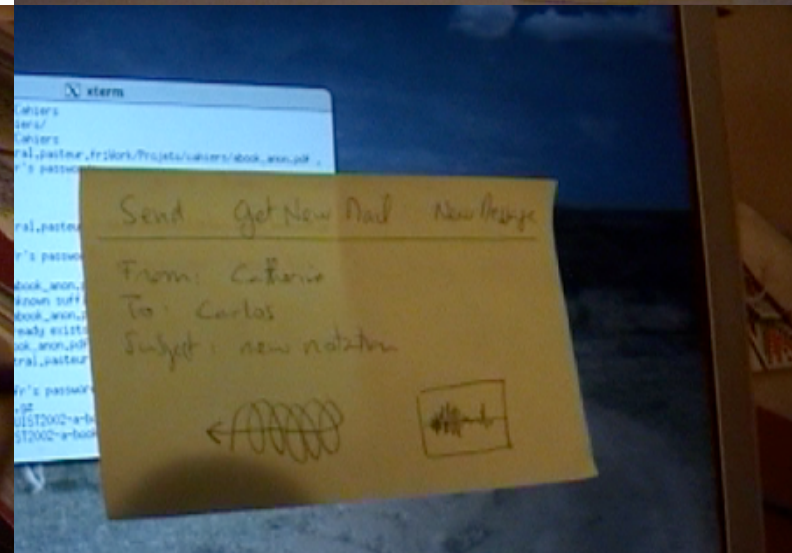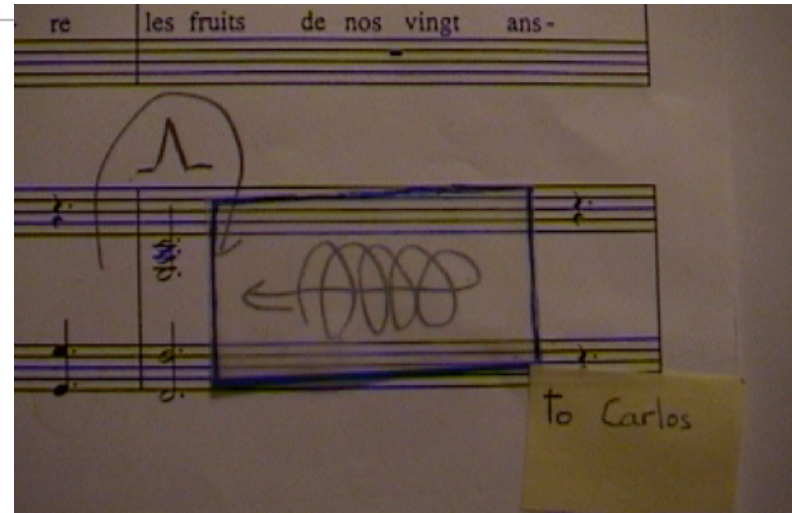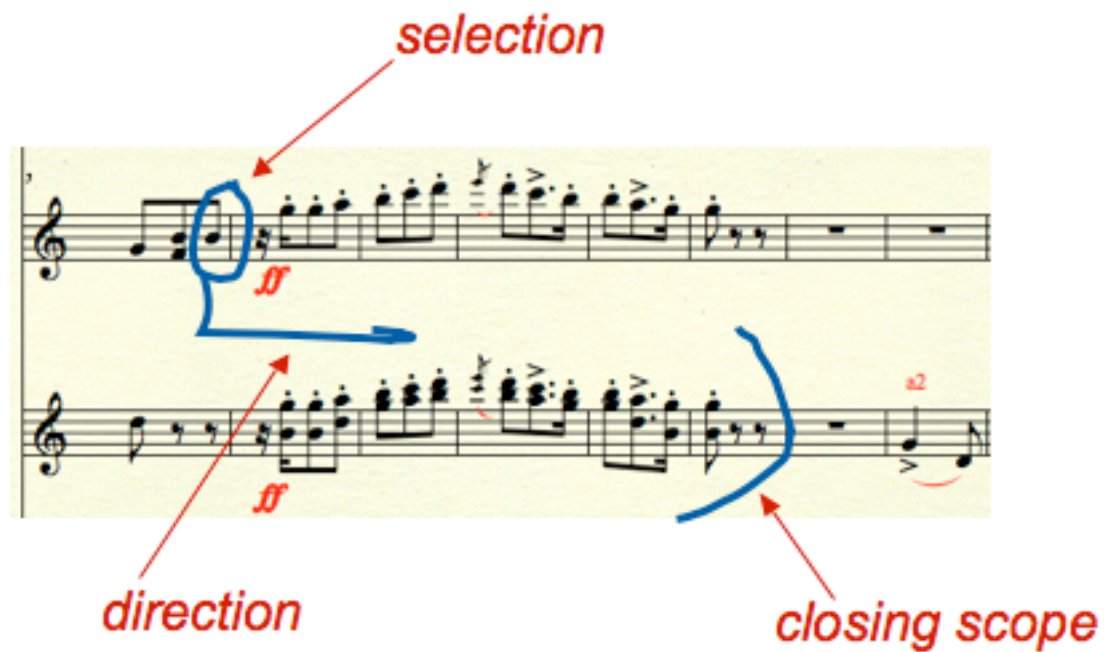abstraction

Prototyping

With OpenMusic

Prototyping

Video prototyping

Prototyping

Customized interactions with paper

(with T. Tsandilas, in|situ|)

Conclusion

Contemporary composers:

are often highly skilled computer users

like to experiment

have a short appropriation cycle

But other users are creative too:

these findings apply in interesting ways to our work with

research biologists

Our focus:

understanding the use of augmented paper

a complex process for a simple technology