

the reactable, a tangible musical instrument



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++ team background

+ interactive sonic systems

Sergi Jordà (researcher, composer & performer): instrument design

Martin Kaltenbrunner: human computer interaction, computer vision

Günter Geiger (pure data): sound synthesis engine

Marcos Alonso: graphics synthesis

+ MTG: music technology group

Director: Dr. Xavier Serra

IUA: audiovisual institute

UPF: Universitat Pompeu Fabra

mostly working in the area of music analysis and synthesis

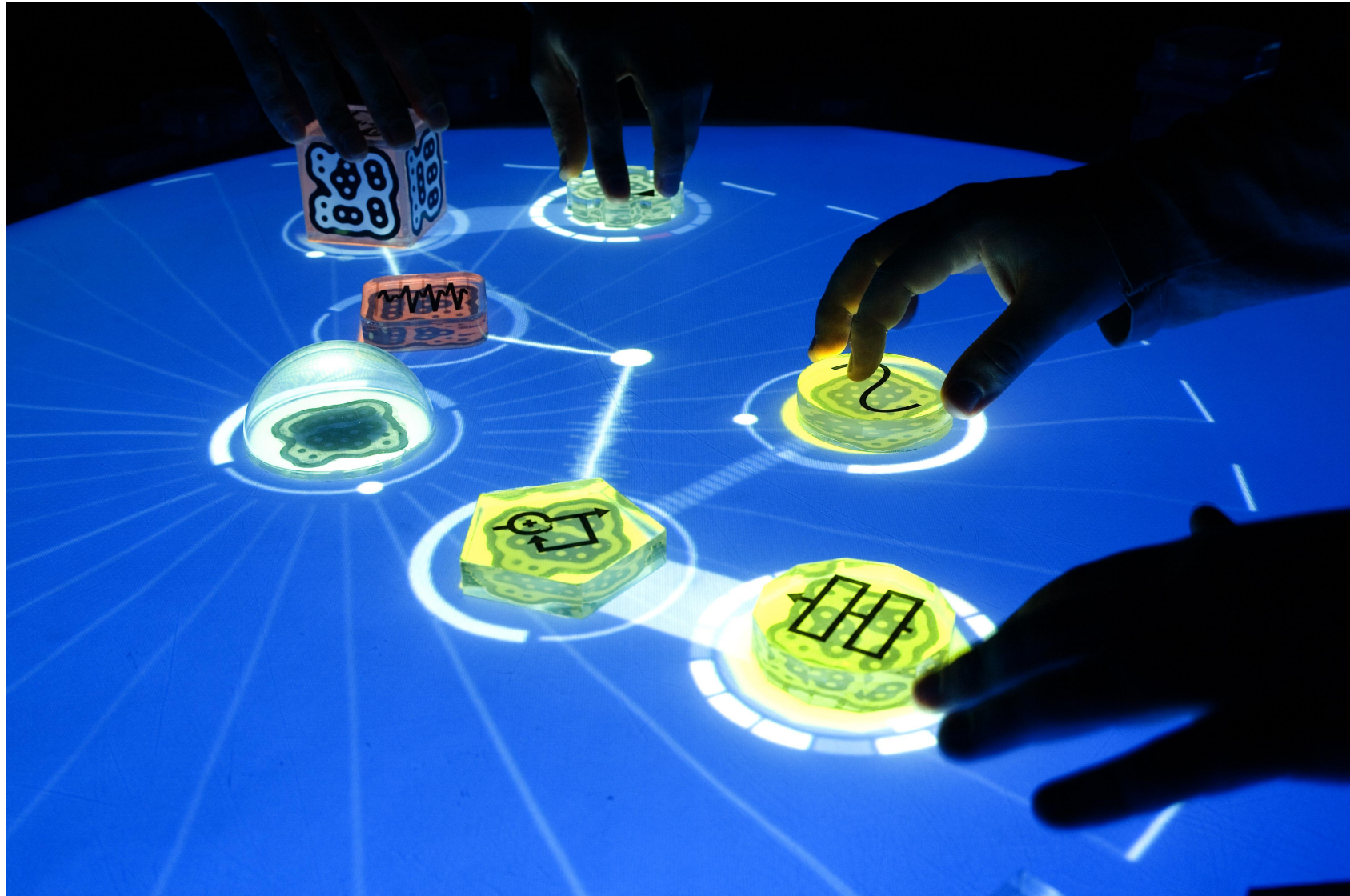
music information retrieval, singing voice processing

interactive sonic systems, musical instrument design

++ reactTable

1

++ tangible modular synthesizer



++ the original idea 2003

+ definition

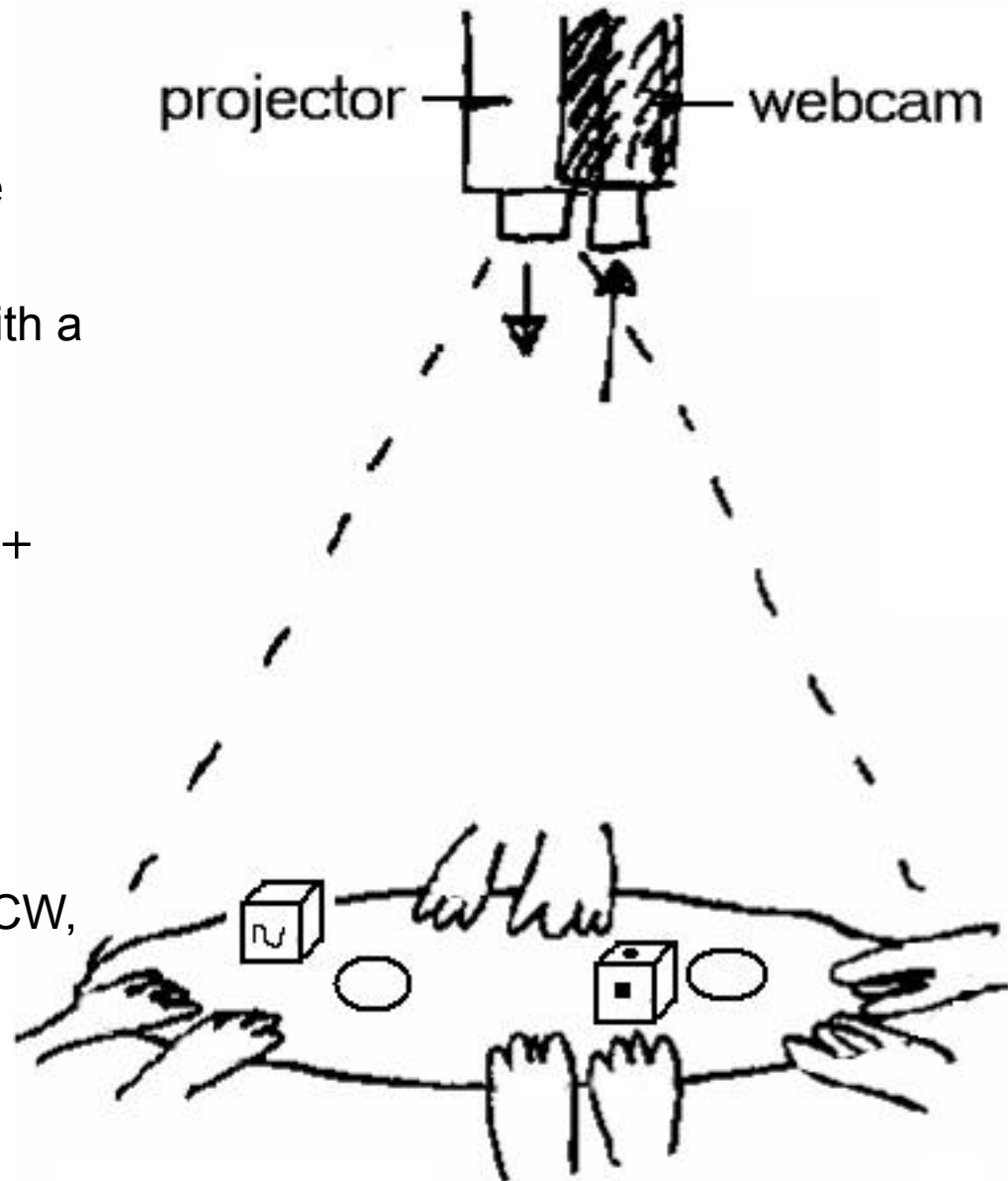
an electronic music instrument with a tangible user interface

dimension: round table with a diameter of ~ 1m

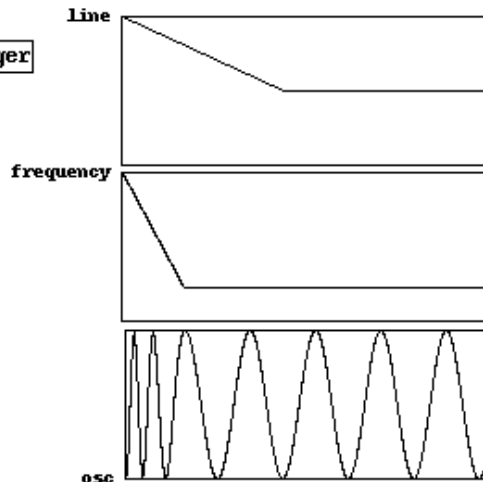
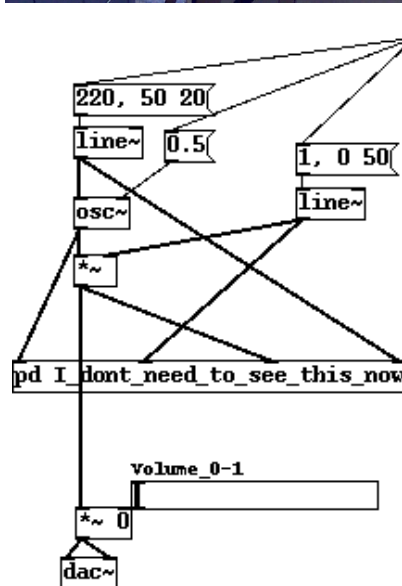
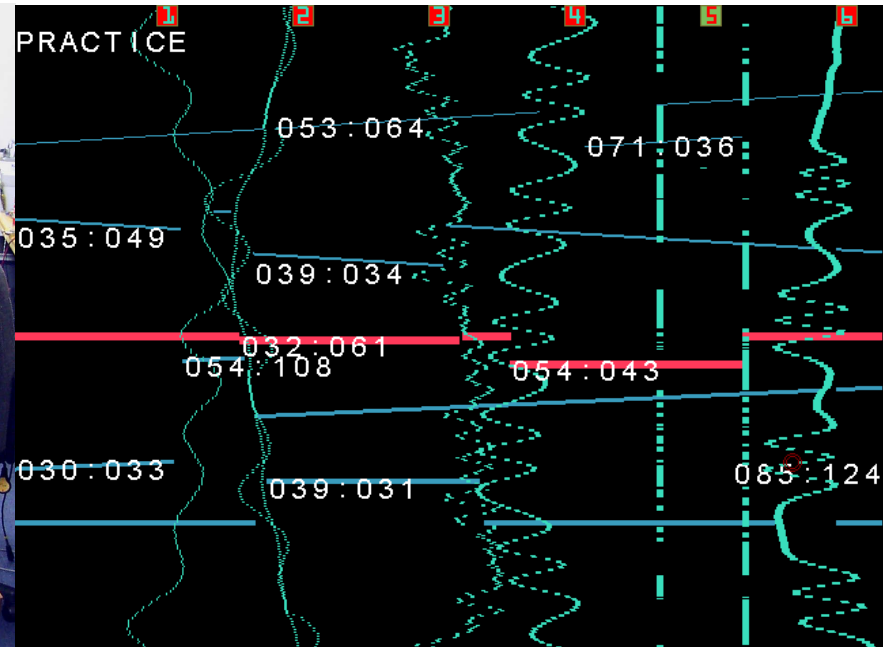
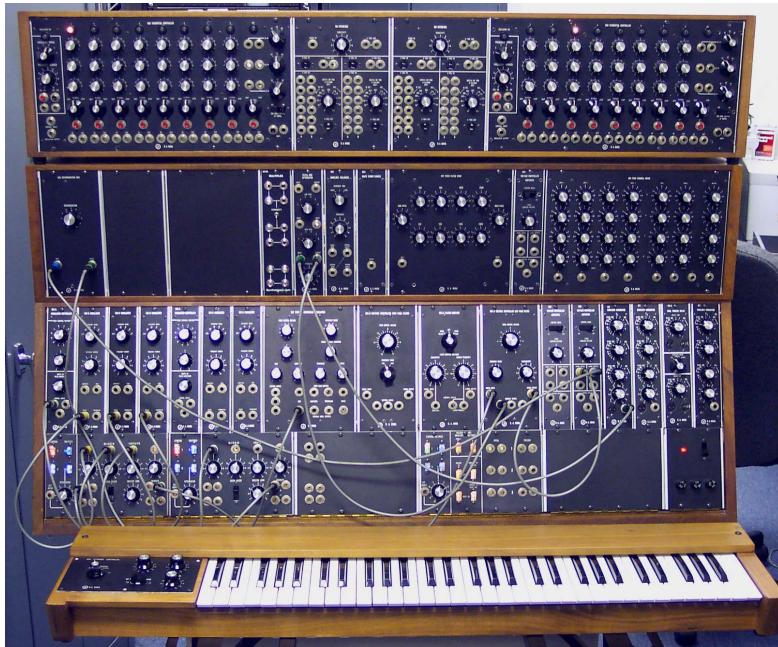
reactTable =
Moog + MAX/MSP +
Tangible UI

+ keywords

tangible interface, human computer interaction, CSCW, modular synthesizer, electronic music, ...



++ fundamental inspirations



++ acoustic vs. digital instruments

+ acoustic instruments

The physical sound production results in a very narrow variety of possible sounds: strings, tubes, membranes.

The sound production is directly coupled with the control and any its sonic, tactile or visual feedback.

The instrument is perceived and handled as a single musical artifact.

+ digital instruments

Modern electronic and digital synthesizers are capable of creating a vast variety of heard and yet unheard sounds. The sound generation possibilities are virtually endless.

The sound production is completely decoupled from the control. Additional and varying controller devices can be used. The instrument is often not recognizable as such and limits visual and tactile feedback.

The dilemma of the possibility of generating any desirable sound and the lack of suitable control devices.

++ our design approach

+ everything is possible

we assume that we have access to a universal sensor which provides all necessary information about the instrument and the player

→ **avoid to be driven by a technology by its possibilities and its constraints**

+ software prototype simulation

e first implemented a software prototype to develop the fundamental instrument ideas and interaction paradigms

+ early prototype implementation

creation of a small scale tangible prototype to study real world aspects of tangible interfaces, experimental object design, sensor evaluation

+ final instrument construction

based on the experience of software and hardware prototyping

++ first experiments, Dublin 2003



++ first public prototype, Hamamatsu 2004



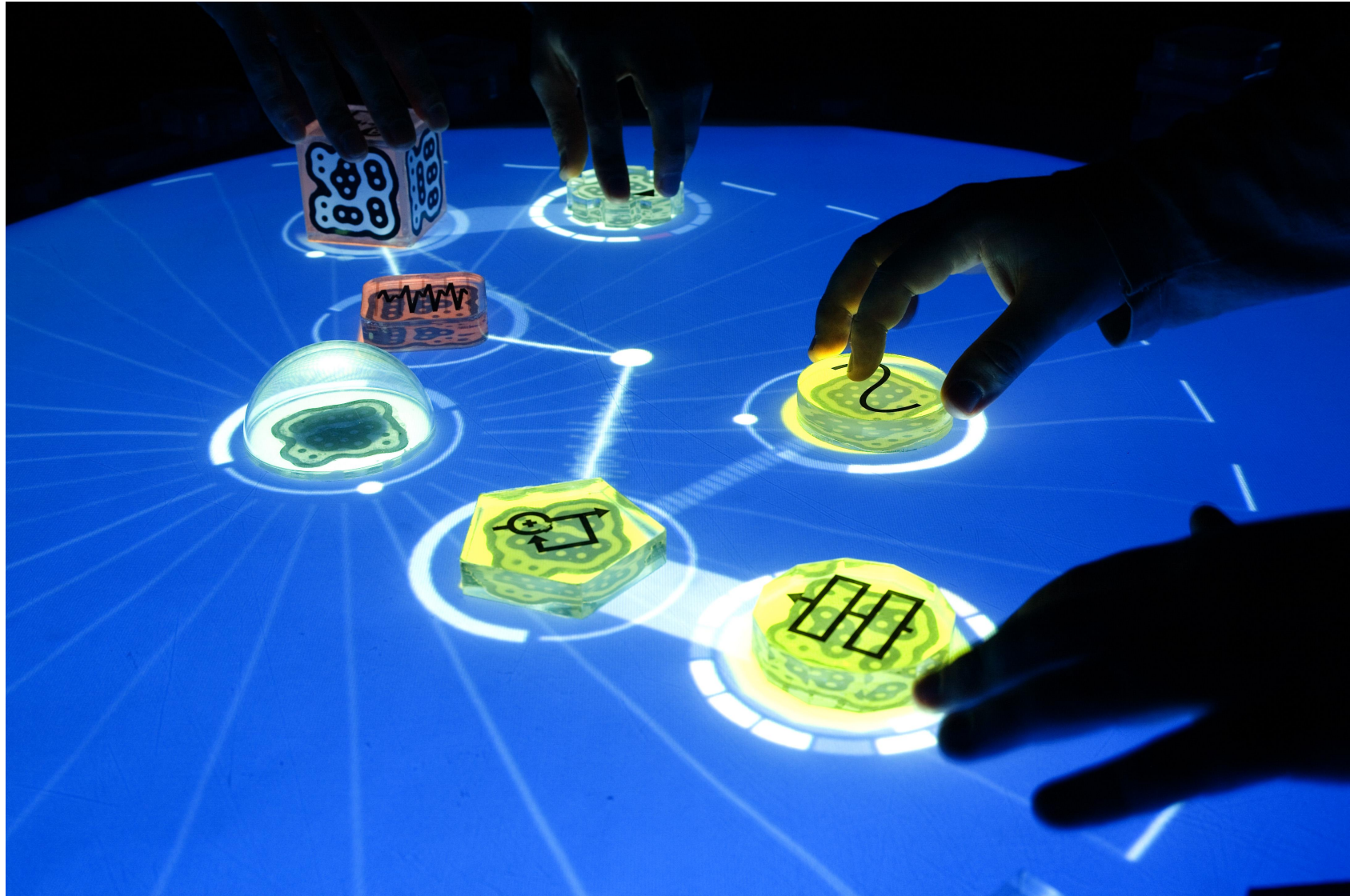
++ first public concert, Linz 2005



++ Björk show, BBC 2007



++ commercial presentation 2008



++ instrument goals

+ intuitive, learnable

zero instructions, no help, no alphanumeric display, easy entry

+ sonically challenging and interesting

not a sound toy, player can develop musical skills

+ collaborative

multiple players on one single table, or networked

+ suitable for professional musicians & novices

in live performances, in public installations

+ fully controllable

no hidden presets, no default behaviour

+ natural interaction

no buttons, no cables, no wearables: just hands and “plain” objects

++ instrument components

+ sound synthesizer

generates the actual musical experience

+ graphical synthesizer

generates visual feedback based on sound and user input

+ central management component

input processing, gesture recognition

dynamic patch generation

sound & graphics synthesizer control

networking interface

+ sensor component

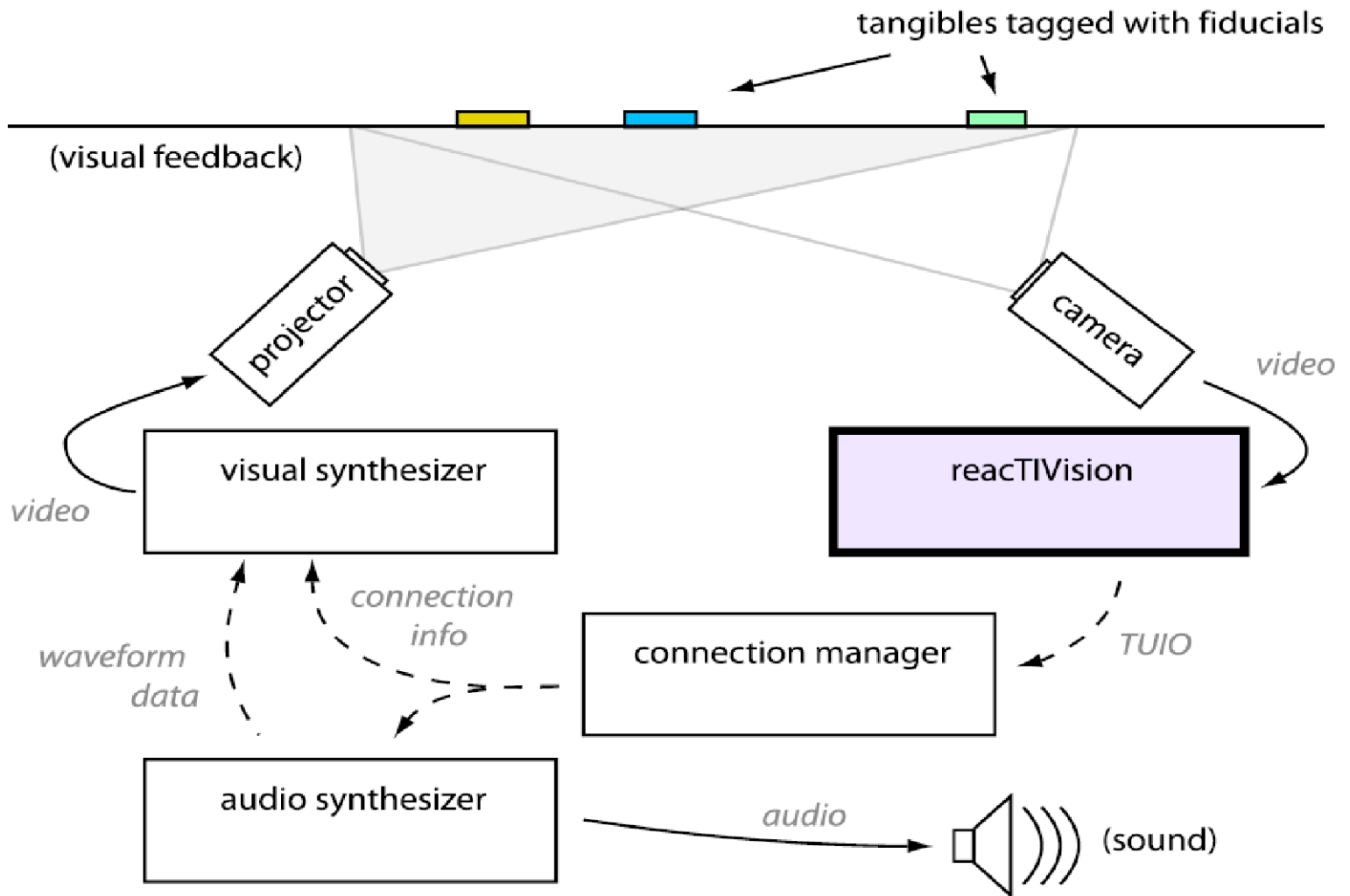
computer vision using visual markers

provides information about object ID, location and orientation

+ tangible interface

table, object set, sensor hardware, projection

++ system diagram

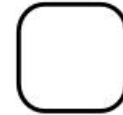


++ shape: generic object classes

+ **sound generators:** square, cube



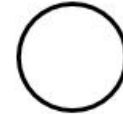
+ **sound processors:** rounded square



+ **mixers & modulators :** pentagons



+ **control generators:** circle



+ **step sequencers:** polygon circle



+ **synchronizers:** dome (half sphere)



+ **global objects:** round star



++ dynamic patches

+ no explicit connection gesture necessary

optional „hard-linking“ by bringing two object close to each other

+ simple connection rules

distance: closest object

compatibility: sound input/output, control input/output

availability: does the closest object have a
compatible and free port

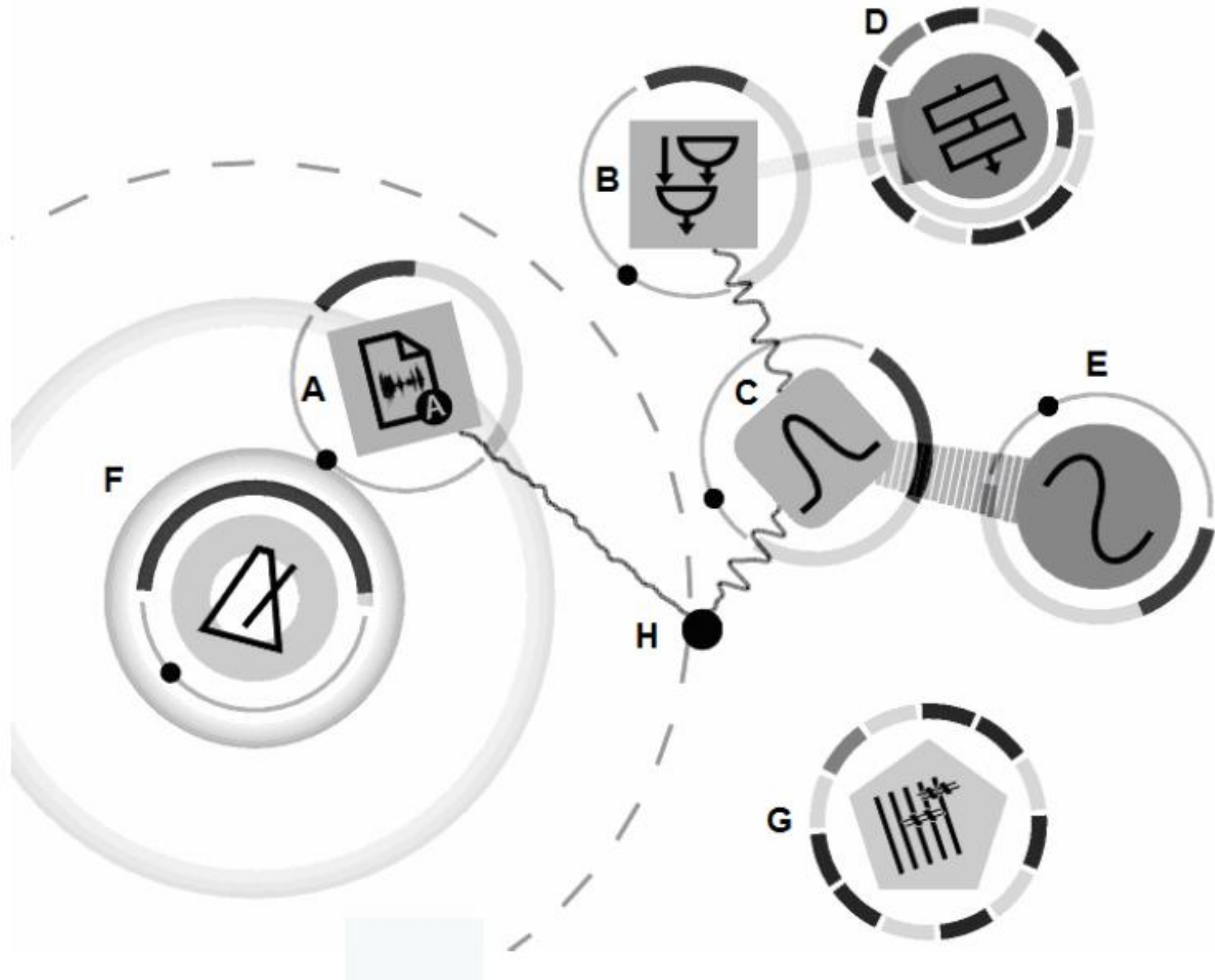
+ building vs. playing

building & playing instrument branches at the same time

single mode: no dedicated editing or runtime mode

configuration can be done with dedicated selector object or cards

++ generic object function



++ visual feedback

+ connection state:

established links
hard-links, mute

+ object state:

availability, activation

+ sound data:

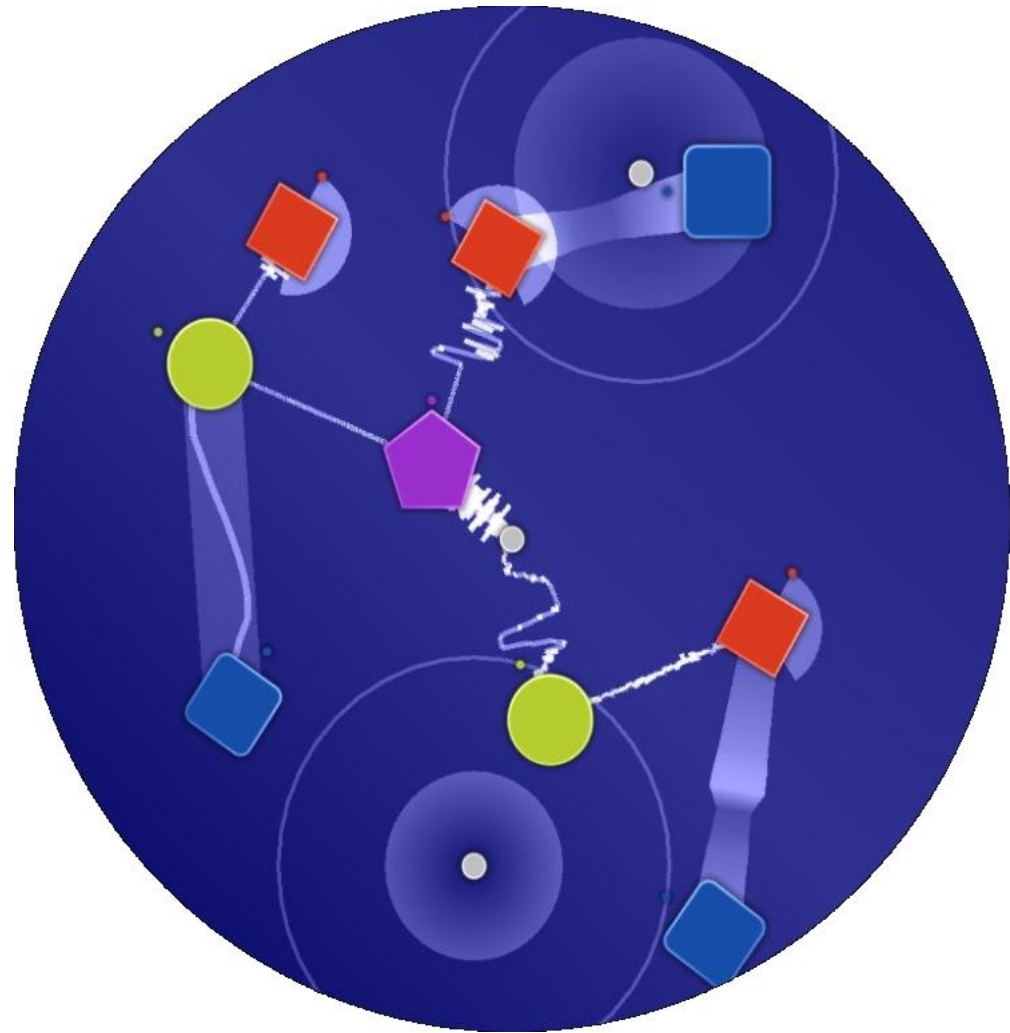
travelling waveform

+ control data:

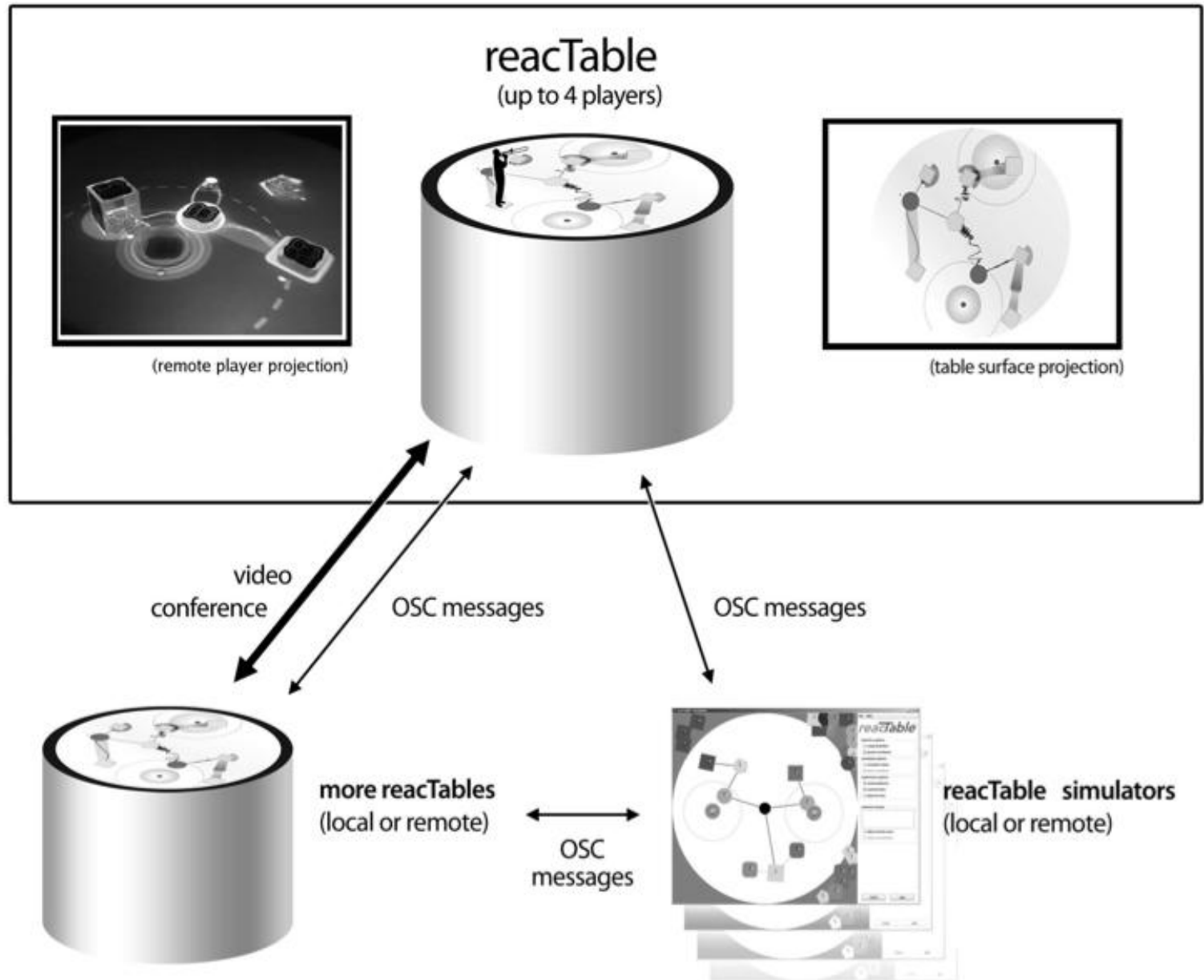
control data flow

+ synchronisation:

sync range, sync hits



++ collaboration scenarios



++ tangible musical interfaces

2