

COMMUNICATION
OF
SOURCE CODE DESIGNS
THROUGH
SKETCHING

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Diploma Thesis
advised by Leonhard Lichtschlag

CONTEXT

```

define(function (require, exports, module) {
    "use strict";

    var AppInfo = require("utils/appInfo"),
        Global = require("utils/global"),
        BuildInfo = require("utils/buildInfo"),
        Commands = require("command/command"),
        CommandManager = require("command/commandManager"),
        Dialogs = require("dialogs/dialogs"),
        UpdateNotification = require("utils/updateNotification"),
        FileList = require("utils/fileList"),
        NativeApp = require("utils/nativeApp"),
        Strings = require("utils/strings"),
        AboutDialog = require("dialogs/aboutDialog"),
        Contributors = require("utils/contributors");

    var buildInfo;

    function onReady() {
        EditorManager.setSelectedHolder(EditorHolder);

        // Let the user know Brackets doesn't run in a web browser yet
        if (Brackets.isInBrowser) {
            Dialogs.showModalDialog(
                Dialogs.DIALOG_ID_ERROR,
                Strings.ERROR_IN_BROWSER_TITLE,
                Strings.ERROR_IN_BROWSER
            );
        }

        // Use native scroll bars if we aren't on Linux. If we're on Linux, only
        // use native scroll bars when the mouse is not plugged in or when
        // using the "Always" scroll bar setting.
        var mouseMatch = /Mac OS X |Linux/;
        if (navigator.userAgentMatch(mouseMatch) && Number.parseInt(window.scrollBarWidth) > 0) {
            // Use a scrolling div for scroll bars
            var $scrollDiv = $("

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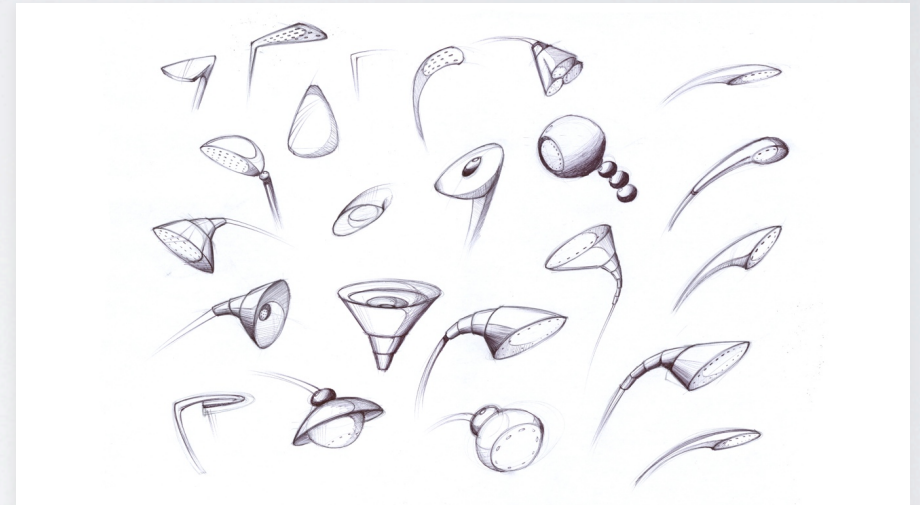
2


```

SKETCHING

- visual representations of imagination
- used for ideation & innovation
- means of communication

Tversky 1999, 2002
Tversky and Suwa 2009
Eppler and Pfister 2011

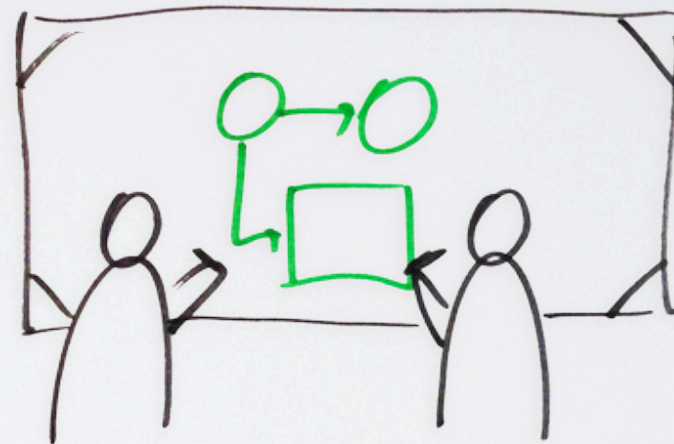


create, share and document knowledge

SKETCHES & DEVELOPERS

1. understanding existing source code
2. designing & refactoring

Branham et al. 2010
Cherubini et al. 2007
Ko et al. 2006
LaToza et al. 2006
Walny et al. 2006



Sketches get modified, copied, shared and are archived.

INITIAL STUDY

observations at a company in Aachen

- 2 meetings of software architects
- 3 interviews

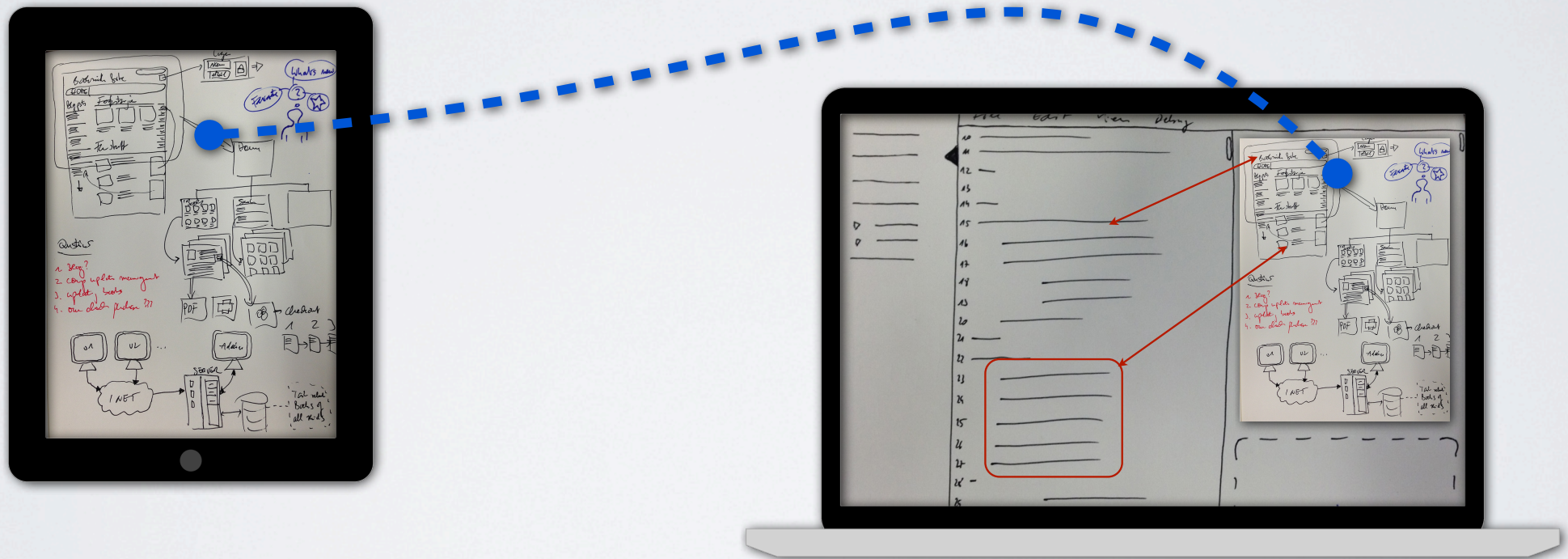
knowledge is in the head



helpful during onboarding process

MY APPROACH

Connection between sketches and source code



PROTOTYPING

DIA cycle with 6 users

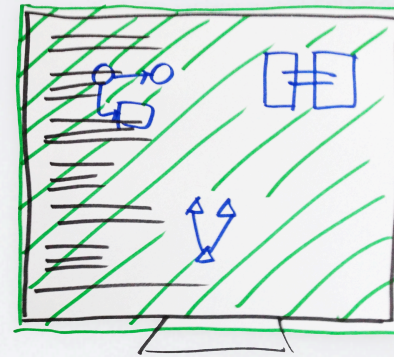
paper prototype



Adobe Brackets extension

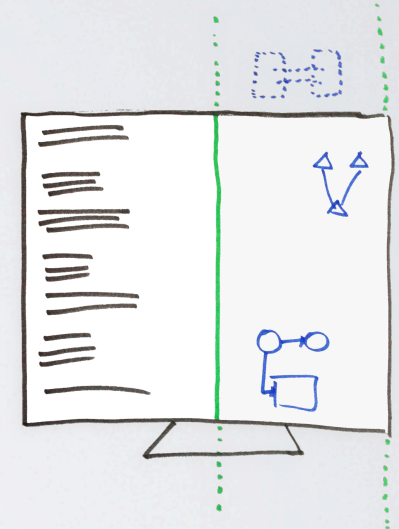
map
view

overlay layout



Mission Control

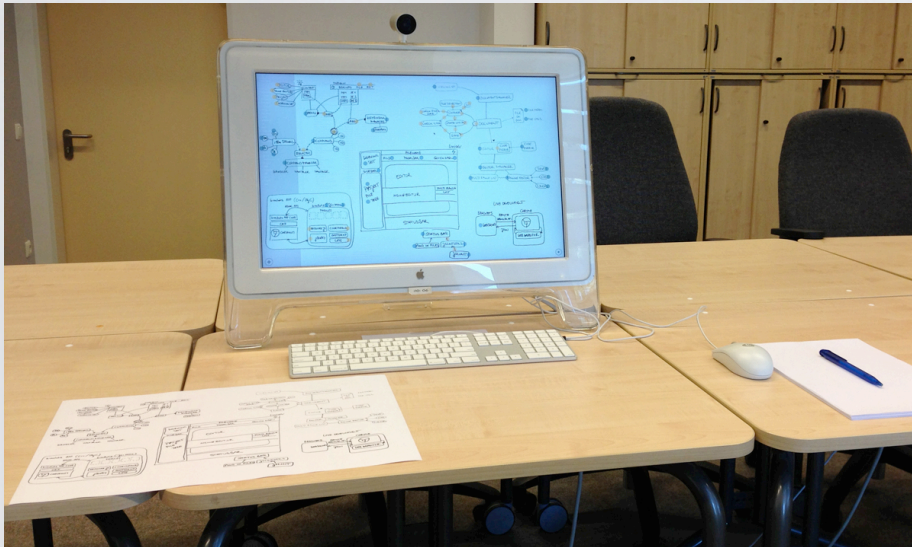
split layout



Sketchbar

demo

USER STUDY

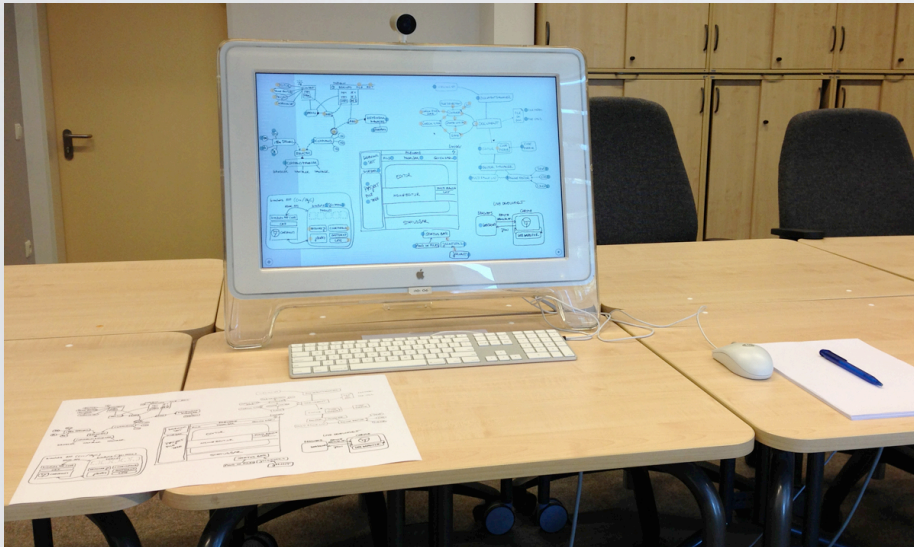


- navigational study
- semi-structured interviews

2 tasks

1. fix a bug
2. add a feature (3 subtasks)

USER STUDY



32 participants

27 male and 5 female

4 professional software developers

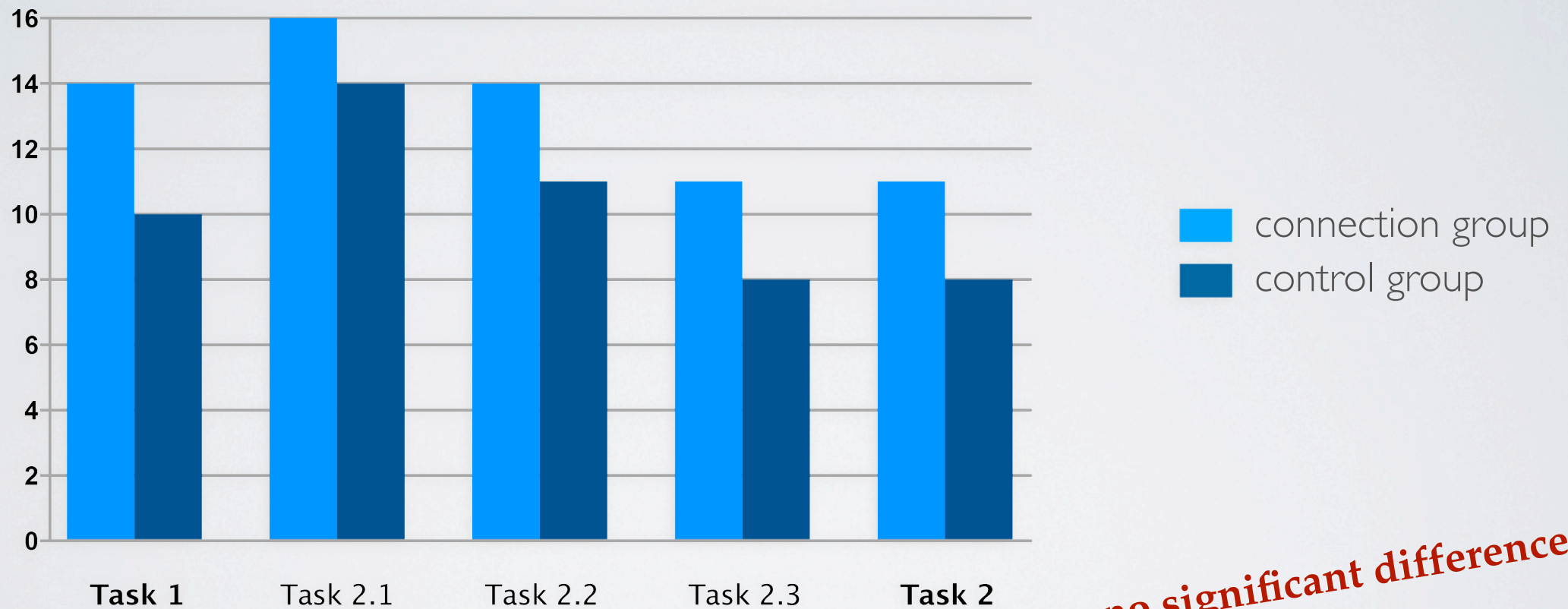
between groups study design

⇒ connection group (Mission Control only)

⇒ control group

USER STUDY - RESULTS

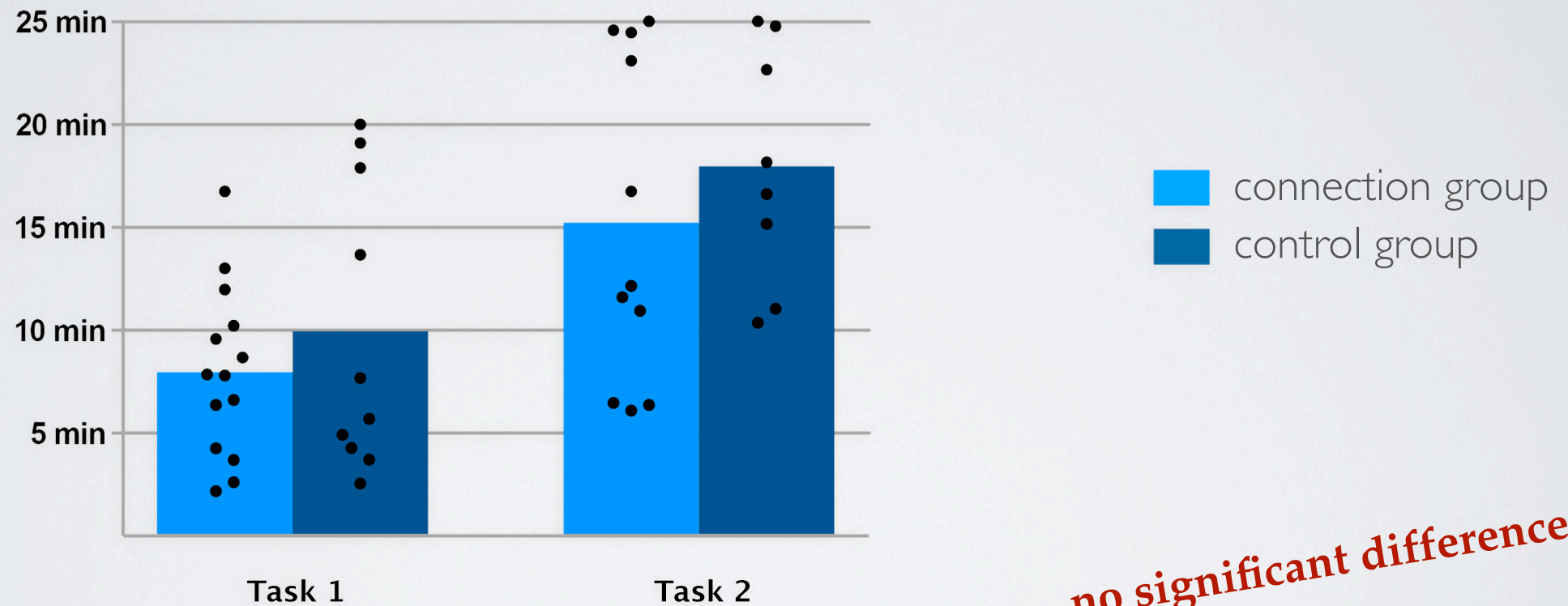
task success



USER STUDY - RESULTS

task completion time

successful participants



no significant difference

USER STUDY - RESULTS

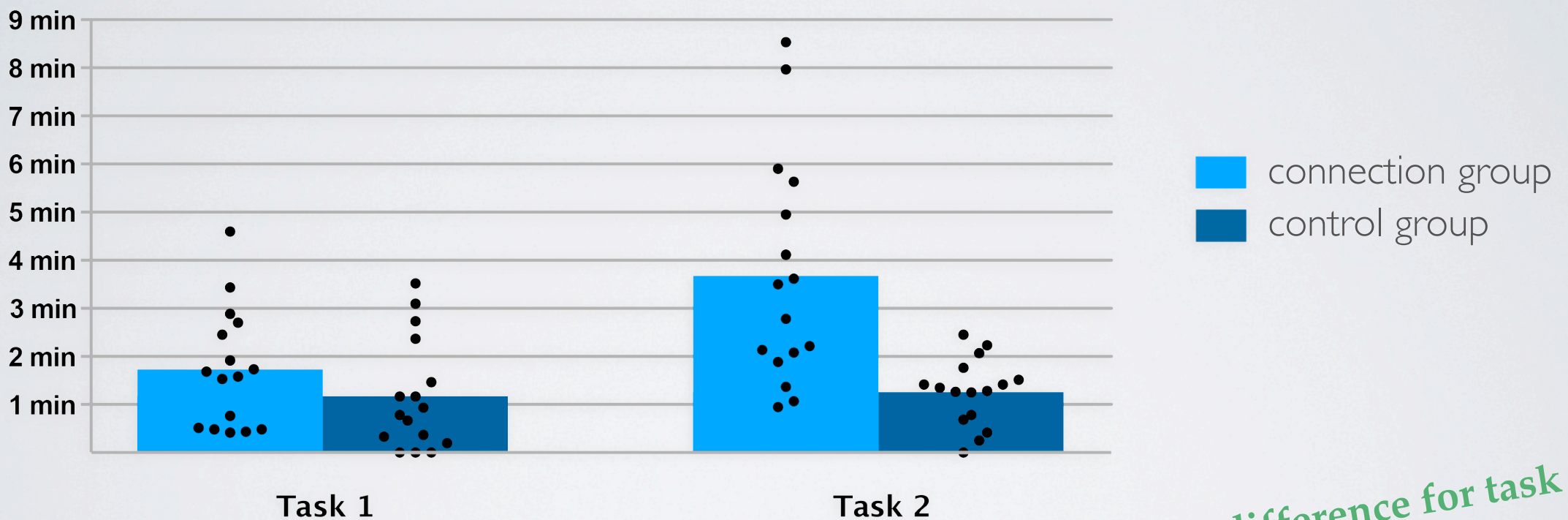
amount of glances at sketches



significant difference for task 2

USER STUDY - RESULTS

time spent looking at sketches



significant difference for task 2

USER STUDY - RESULTS

observations during sessions

 control group

common set of operations

- navigation via project tree and tabs
- scrolling through files
- searching
- reading comments and code

Ko et al. 2006
Starke et al. 2009

 connection group

change of behavior

- navigation via Connection Dots
- review of context
- orientation within context

⇒ mental walkthroughs

USER STUDY - DISCUSSION

identified problems

- certain amount of sketches and connections needed
- creation of sketches / visualizations
- standardized sketching
- currentness of sketches

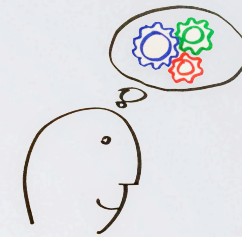
task appropriateness

- task 1 as a prelude for task 2
- tasks were appropriate in combination

CONCLUSION

integration of sketches and connection to source code

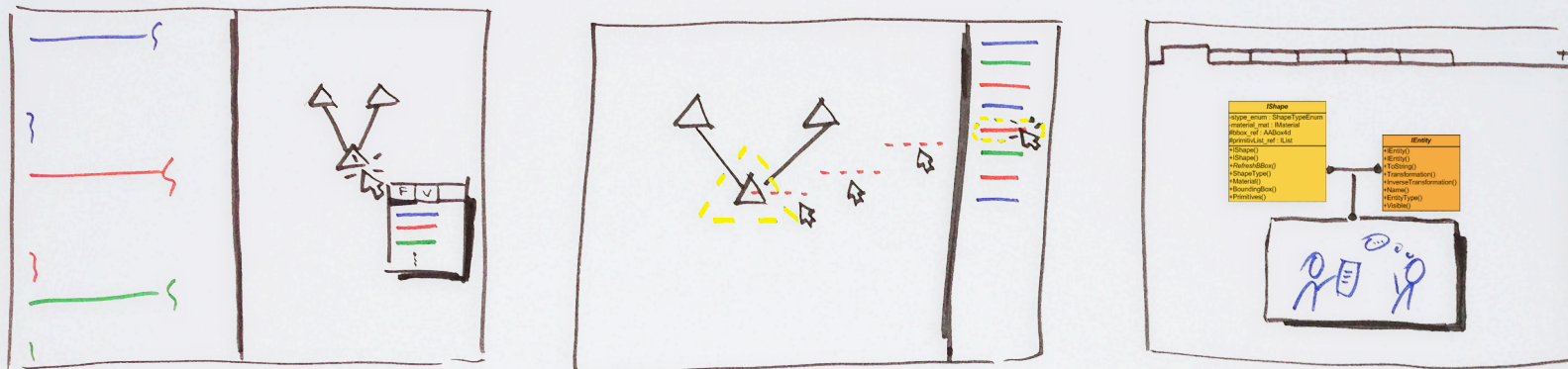
- ⇒ supports forming mental model
- ⇒ not significantly faster, but different way
- ⇒ helpful during onboarding process
- ⇒ additional time and effort needed



FUTURE WORK

integrate multiple sources of information

provide more automatization and assistance



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USER STUDY - RESULTS

amount of participants looking at sketches during task 2

