

A New, More User-Friendly Digital Colour-Picker?

Nicoline Kinch

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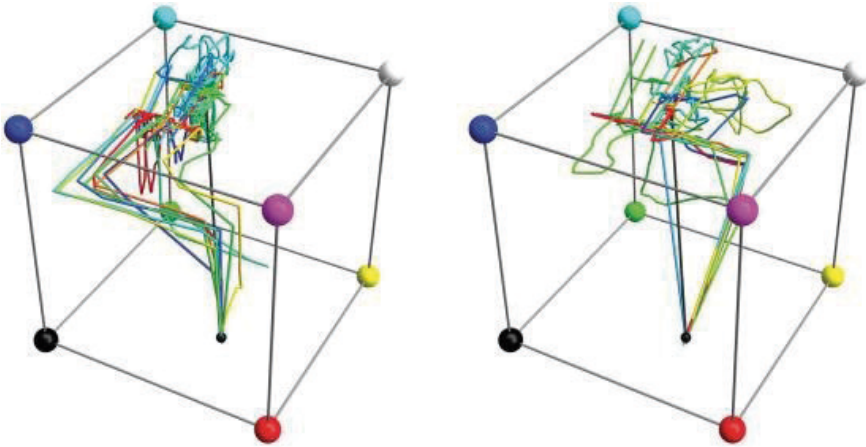
Abstract

In this study a traditional colourpicker (the one in Microsoft Office) is compared with a new kind of colour picker, a prototype called “Kolorpicker”. The fundamental difference between the two is that Microsoft presents colour in 2D, while Kolorpicker uses a 3D globe to show the world of colour. Both efficiency (search-time) and accuracy (ability to find a specific colour) is tested on mostly colour naive subjects. The results show that the 3D application gives better efficiency as well as accuracy. The main conclusion is that naive users of colour pickers would benefit if these were based on 3D.

Purpose/introduction

While software in general is constantly being improved, colour picker interfaces have not changed. This is surprising, in particular since existing tools are both difficult to use and un-efficient; users do not always achieve what they want, for instance a specific colour. Infrequent users encounter problems, and the design is therefore of great importance. *“The colour picker in all major software is crude and unhelpful to understanding, using and applying colour creatively”*, says professor Koederink, University of Leuven, the Netherlands.

(Experienced users can, with all likelihood, use any colour picker, as long as it is familiar to them. For such users the interface design is probably less important) This is studied in recent research*. Illustration 1 shows the attempts of a colour naive user, searching a specific colour in two traditional colour pickers.



*Illustration 1. demonstrates orbits through colourspace when attempting to find a specific colour in two traditional colour pickers. The orbits for all observers (11 colour naïve students of psychology) are presented, each observer in a distinct hue. The initial (forced) RESULT is indicated by the small black sphere, and the GOAL by a gray sphere (occluded by the tails of the orbits). The shortest route in RGB space in the Euclidean metric is indicated by the black line**

Can these shortcomings in the quality of colour picking applications partly or fully be explained by the fact that these tools are based on 2D presentations of colour? Would a 3D colour picker have a higher degree of usability?

The Swedish company Kolormondo has a patented prototype for a new, modern style colourpicker, called “Kolorpicker”. It is based on the 3D globe of the same company.

The purpose of this study is to compare traditional digital colourpickers with a new type of colour picker, the “Kolorpicker”, both in terms of

- efficiency, defined as search-time and
- accuracy, defined as ability to find a specific colour

We choose the colour-picking software in Microsoft Office (MO) as our “classical” interface. This is an intentional choice. Naive users do not necessarily use other more specialised programs, such as Photo Shop, but are likely to start with colour pickers already included in the applications they are used to. And the colourpicker of Microsoft is not much different to others.

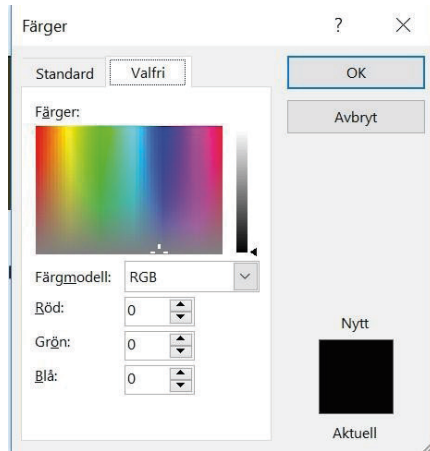


Illustration 2. The colour picker in Microsoft

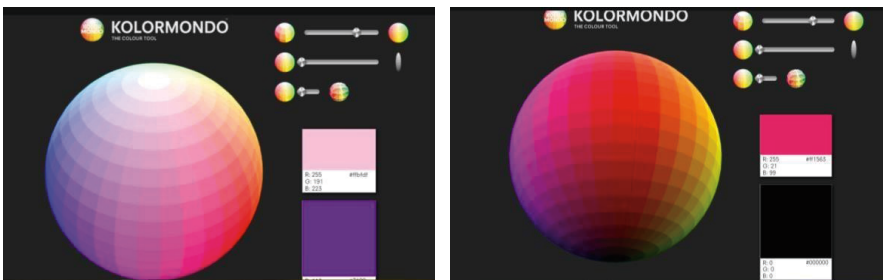
Short presentation of the Kolorpicker prototype

The prototype, “Kolorpicker” can be tried by signing in at the very bottom of www.kolormondo.com. Please use test@kolormondo.com and the password “ColourPickerTest” to log in. Here follows a short presentation:

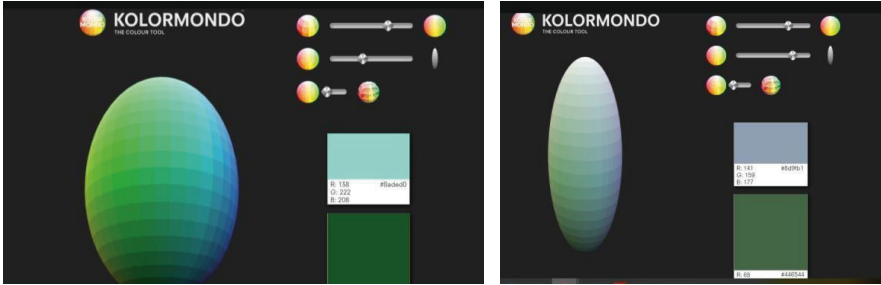
Kolorpicker is based on a new, patented, way to present colours in a globe. It is developed to be easier to understand and more intuitive to use. All colours are seen in relation to each other, rather than on a flat two-dimensional “spreadsheet”. One can compare with presenting the Earth on a flat map; maps distorts and sometimes even destroys proportions and relations while a globe gives a full presentation.

Kolormondo and therefor also “Kolorpicker” is inspired by Philipp Otto Runge, but have modernized his concepts by basing the globe on CMY (and, for the digital version using RGB).

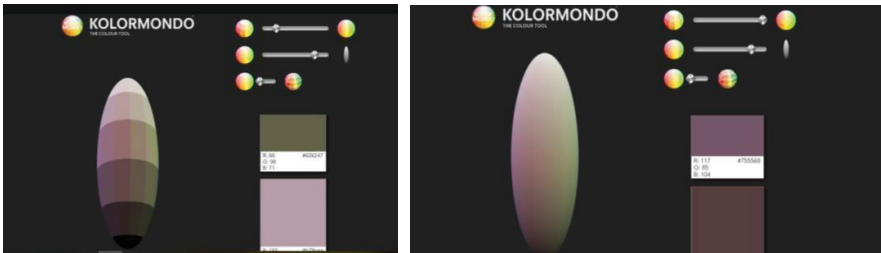
The North Pole of the colour globe is white, the South Pole is black, the most chromatic colours are found around the Equator. The globe can be turned in any direction using the mouse. Clicking on a colour gives its RGB values.



By using the second tool bar; the user moves into the globe, gradually getting closer to the middle grey scale:



With the top tool bar, you can adjust the number of gradients, from very few to endlessness:



Scope

Three American university teachers joined the project and their undergraduate students volunteered as subjects, from Clemson (Graphic communication), RIT (School of Media Sciences and Ryerson (Print Media Research Center) respectively. We also carried out the study on a group of newly retired subjects in Sweden. They belong to a club for the card game Bridge, thus, intellectually capable.

10 subjects in Ontario College of Art and Design (OCAD), Canada also did the test. The material could not be compared with the rest. These students measured time themselves, and did not make any recording of accuracy, We have not included their results.

The study finally includes three universities in USA with a total of 24 students and 10 retired individuals in Sweden. It was carried out October-December 2018.

1. In two of the universities, as well as the group in Sweden, half started with one and then went on to the other colourpicker – and vice versa. In one university, RIT, there is no paired data, but subjects did either the established colourpicker or the prototype.
2. The subject started by being interviewed re their experience so far with colourpickers
3. The subject was allowed 2 minutes to familiarize herself with the software
4. The subject was shown 4 digital colour swatches, one at a time. (The RGB values where NOT shown).
5. He/she was asked to find the colour in Microsoft/Kolorpicker. Each attempt was being timed and the RGB values achieved where noted.
6. The subject was then asked to do the same 4 colour searches with the other colour picker. (This did not happen at RIT)
7. Finally, each subject answered a few questions on their experience of the activity

Four colours were used. They were intentionally chosen to be increasingly more difficult to find.



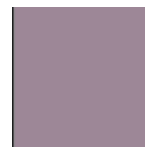
RGB 0,0,255



RGB 255,85,85



RGB 80,62,25



RGB 149,126,142

for each individual, both the number of seconds it took to find the respective colour and the figure for each R G and B value for the colour – what it should be and what the subject achieved. We have calculated the average time spent as well as the average R G and B value. In order to compare, we have then given “points” in divisions of 8 to the RGB value. (if the subject was less than 9 dividends from the correct answer, the point was 0. Between 9 and 16 dividends away, the point was 1, 17-24 dividends away gave 2 points etc) As an example, for the first colour, where the correct colour has RGB 0, 0, 255; the average result of in Microsoft is 44, 62, 244, giving the points 5, 7, 1, the average result being 4,3.

Results

1. Result for all users
2. Beginners (and heavy users)
3. Students/recently retired

	Colour 1		Colour 2		Colour 3		Colour 4	
	time	result	time	result	time	result	time	result
Microsoft	56	3,3	45	1	58	3	48	14
Kolorpicker	30	1,3	46	1	48	1	81	5

For colour 1, Kolorpicker is 1, 8 times quicker than Microsoft and the accuracy is 2,5 times better.

For colour 2, the results both in time and accuracy are similar between the two tools.

For colour 3, Kolorpicker is the winner, it takes 82 % of the time and provides 3 times better result.

For colour 4, Microsoft users only spend 60% of the time compared with Kolormondo. The accuracy is poor for both colour pickers, Kolorpicker is the “least bad” with 5 compared to 14 points in result.

So, Kolorpicker gives better accuracy requiring less time for two of the four colours. For one colour the applications perform equally well and for the last colour the result is ambiguous.

2. Beginners

We planned a study on colour naïve people. However, many of the subjects defined themselves as having some experience – and a few where “heavy users”. The less than half that had no experience of colour pickers are of special interest to us:

BEGINNERS

	Colour 1		Colour 2		Colour 3		Colour 4	
	time	result	time	result	time	result	time	result
Microsoft	70	4,3	50	1	75	2,7	52	0,3
Kolorpicker	18	2,3	41	1	47	1	124	4

Overall beginners needed more time than the whole group; in Microsoft, 247 seconds in total, as compared to 207 for the whole group and 230 seconds on Kolorpicker, compared to 205 for the whole group.

For colour 1, Microsoft needed 3,8 times as much time with poorer results, 4, 3 compared to 2,3 points for Kolorpicker.

For colour 2, accuracy was excellent for both tools, while Kolorpicker needed only 80% of the time to achieve this.

For colour 3, Kolormondo took 55% of the time compared to Microsoft and the accuracy was almost 3 times as good.

For colour 4, Microsoft is the big winner. Kolormondo needed 2.4 times as many seconds and the accuracy of the Microsoft users was almost 10 times as high.

The result for the beginners has thus the same tendencies as for the whole group; it speaks in favour of Kolorpicker in both accuracy and time for two of the colours. For one colour the difference is smaller, although still in favour of Kolorpicker. In colour 4, Microsoft comes out much stronger.

The heavy users are less than a handful, so the value of studying their achievements in detail is limited. However, not surprisingly, they spent considerably more time on Kolormondo than was new to them, than they did in Microsoft. Maybe more unexpected, their accuracy was much better in Kolormondo for the first 3 colours.

3. Students/Retired

STUDENTS

	Colour 1		Colour 2		Colour 3		Colour 4	
	time	result	time	result	time	result	time	result
Microsoft	64	2,6	45	1,3	44	2,7	47	0,3
Kolorpicker	35	0,7	43	1,7	46	1	44	6,3

RECENTLY RETIRED

	Colour 1		Colour 2		Colour 3		Colour 4	
	time	result	time	result	time	result	time	result
Microsoft	35	4,3	44	1,7	92	3	51	0,3
Kolorpicker	15	3,3	52	1	54	1	174	3

The difference between students and recently retired in time spent is not as high as one would possibly expect. Retired subjects spent 222 seconds in total in Microsoft as compared to 200 for the students. For Kolorpicker however, the retired got stuck in the colour 4, so that the total time spent is 295 seconds, as compared to 168 for the students. Overall, students performed better, but relatively speaking there are no major differences between the 2 groups. Colours 1 and 3 got better accuracy in Kolorpicker. For colour 2, students did better in Microsoft, while the elderly did better in Kolormondo also for colour 2. In colour 4 both groups did better in Microsoft.

What subjects said

When the test was over, the subject was asked to comment about his/her preferences.

At Clemson: “All participants thought that Kolormondo was easier to use versus Microsoft Word and would prefer when using a color picker to see colors within a spherical/global shape” writes their teacher who executed the tests.

Tree of the five students at Ryerson specifically compared the two tools when commenting afterwords. They said, respectively:

- “For Kolorpicker, the process was so much easier and user-friendly”
- “Both colour pickers had their difficulties. Microsoft depended on sliders, which was inefficient, while Kolorpicker had a “larger” variety of choice, so it took longer to find the accurate colour.”
- “It was very easy to find the colours using the Kolorpicker, rather than trying to visualize what changes RGB will produce. It is better to visually see a model of colour”.

IN RIT, only 10 out of the 20 students tested Kolorpicker. Two of those comments in favour of the Kolorpicker grid. And one student said that “a globe make sense”. The possibilities with choosing the level of gradations in Kolorpicker was appreciated. However, many of the subjects, in particular the Swedes, strongly disliked that the sphere rotation continued after releasing the mouse. It is also clear that it took some time to get used to the concept of moving into the globe to find less saturated colours and that therefor colour 4 got poor results for most of the subjects.

A few that accidentally happened to play with the third toolbar (this was not part of the study), and could see directly in to the middle of the globe, found this easier to immediately understand. This was a surprise to us, we have only regarded the third tool bar as a “funny gadget”, with little value. Possibly, this should be rethought and a next prototype having such an interface rather than the “complete” globe should be tested?

No student has stated that he/she prefers Microsoft office. The Swedish subjects generally claimed to find the task, in both colour pickers difficult and frustrating. A few of them preferred Microsoft office, since “it did not move”.

As mentioned earlier, 10 students in Toronto, Canada also made the tests, but have not been included in the results of the study. However, their comments are similar to the rest. Six of them clearly prefers Kolorpicker. Three do not have a preference, while two subjects are more ambiguous. One (a “professional” user) says “I found Microsoft easier to use. However, I feel the easiest surface is that of Kolorpicker. But contradicting myself, I found Microsoft easier because it is an interface I am used to.”

Conclusion/Analysis

Only 34 subjects took part in this study. Certainly, the results would benefit from a bigger test. Furthermore, only 15 of these are truly colour naïve. Many of the other participants have at least some experience and can therefore be expected to be quicker and perform better in the interface they are already familiar with.

Nevertheless, indications are clear: the new prototype colour picker based on a 3D colour model performs better than existing application. Kolorpicker

- Requires less time
- Helps the user to achieve a better result
- Gets favorable comments by these first-time users

References

- Jan Koenderink, Andrea van Doorn, and Vebjørn Ekroll. 2016. *Color picking: The initial 20s*. ACM Trans. Appl. Percept. 13, 3, Article 13 (April 2016), 25 pages. DOI: <http://dx.doi.org/10.1145/2883613>

Project members

Martin Habekost, Associate Professor, Ryerson University, ON mhabekos@ryerson.ca

Bruce Leigh Myers, Associate Professor, School of Media Sciences, Rochester Institute of Technology, blmppr@rit.edu

Liam O'Hara, Associate Professor, Department of Graphic Communications, Clemson University, lohara@clemson.edu + Bryanne Trice btrice@g.clemson.edu

Glenn McArthur, MDes, Assistant Professor, Ontario College of Art and Design (OCAD), Canada, gmcArthur@faculty.ocadu.ca

Nicoline Kinch, project organizer + inventor, Kolormondo AB, Trosa, Sweden, nicoline@kolormondo.com

Ylva Berns, Senior interaction designer, Trosa, Sweden ylva.berns@gmail.com

John Seymour, advisor, john@johnthefmathguy.com

Appendices

Table 1 All subjects

Table 2 Beginners

Table 3 Students/Retired