

Methods to throw a bubble on small touch devices

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INTRODUCTION

In this project we wanted to find out which possibilities there are to shoot a bubble like object in a smartphone application using only touch input.

More precisely this was important to us because we made a sidescroller game for mobile phones this term and therefore we needed a proper input method to throw a bubble easily onto another object.

We knew already of some games where a similar situation occurs and there they have also implemented some touch input methods to solve this problem. But their solution was not always very pleasant for the user. We wanted to find out why this could be and what could be improved to learn from these examples.

To limit our research we decided to focus on small devices like smartphones and do not also analyze the possibilities on tablet computers. Those are larger and therefore problems small displays may have may not occur but other difficulties may appear.

So in the end our design question was the following. How can we implement a very user-friendly and intuitive possibility to shoot a bubble in a game app on a small touch device for app-gamers?

Overview

In this paper we will start with giving some background information, including a small illustration what our game is all about.

Then we will explain the difficulties concerning touch input as a whole.

Following we will define what we want to achieve and who our target group is.

In the next big chapter we will present some methods how a bubble can be thrown using touch input including their pros and cons.

At the end we will present the outcome of our project and explain which method we finally implemented in our game and why.

BACKGROUND

Definitions

At the beginning it might be necessary to define some terms which will be used frequently in the following report.

- App is the short term for application. In this paper we will use it for mobile application software for smartphones.
- Bubble: In the game we develop as our semester project, the object to be thrown is a bubble. So we decided for convenience to call the object which

shall be thrown bubble. But of course lots of other things could also be thrown.

The Game

The game we develop as a semester project was named Glub. It is a game for Smartphones with a touch device. It is a sidescroller game which uses the touchscreen and the accelerometer of the mobile phone as input.

The main character is a small fish-like character which swims in a glass tube which fills the whole screen. The goal is to get the little animal, which is named Glub safely from the beginning of the tube to the end.

In the tube there are calcareous deposits, where Glub may be bang onto. This can be dangerous, because when it gets stuck there and the level goes on (as it is a sidescroller) then the character may be out of the level very soon. This would mean that the character dies and the level has to start again.

Moreover there are lots of different kinds of moving bubbles in the level. For example the so-called smash bubble. This one can be thrown against a special kind of calcareous deposit, which then explodes and clears the way for the main character. For this kind of bubble we developed an input method how the user can throw it.

To explain the whole game would exceed the scope of this work and it is also not necessary therefore. But it may be important to notice that the gamer has to do lots of other things besides throwing such a bubble, too. For example he has to navigate the character using the accelerometer or burst bubbles with a fingertip.

Theory

As touch devices are relatively new the input methods are not perfected yet, because there has not been experimented enough. The technique behind the products is increasing all the time, and the accuracy of them and their possibilities are already very good. But problems may not only occur because the techniques are bad. Changing the input type may also mean changing thinking and possibilities concerning the input, because it is completely different than what we are used to. You can for example think that you can use a touch input like you use a mouse input on a PC (personal computer). But soon you will recognize that if you use your finger it may be very difficult to click on small buttons and that drawing may get very difficult. There are different reasons therefore. For example a finger is much bigger than a mouse, which means that the input can't be that accurate than a mouse input. Moreover

you will surely occlude some parts of the screen with your finger and you are not used to use your fingers in that way. Once again you had to learn how to use a mouse or how to use a pencil to write. Adult people are very educated in those things in our western culture, but they nearly never use their fingers to paint. So it's just obvious that this may be difficult for us, which may lead to bad user experiences when it comes to mobile applications.

Therefore we have to find new ways, being aware of those problems and trying to deal with those difficulties in innovative new ways.

Goal

To develop a proper solution for our game it was necessary to record what we wanted to achieve. Of course this differs for every game, so we will only reference to our game in this paper.

- The user shall have the feeling that he can fully control what he is doing.
- The input method has to be easy to handle, easy to learn and easy to understand.
- The input method shall be intuitive.
- The user shall be able to shoot the bubble very quickly.
- The user shall be able to predict as exactly as possible the direction where the bubble will navigate to.
- There shall be a challenge in shooting the bubble and therefore it should not be too simple.

Target group

It's also very important to define the target group. In our case those are people who have a mobile phone with a touch input who frequently play games on them. As those are especially, but not exclusively young people like students and schoolchildren we will focus on them. Therefore we will assume that their fingers are not disproportionately big but quite flexible. This may be quite evident because they usually do a lot with their phones and thus they train their fingers.

APPROACH

We analysed lots of apps and found lots of different touch input methods for throwing bubbles in there. We now want to give you an overview over some of them. There we will explain how they work, what their strength and weaknesses are and in which games they were used. To simplify things we gave each of them a name we found appropriate.

Take the bubble

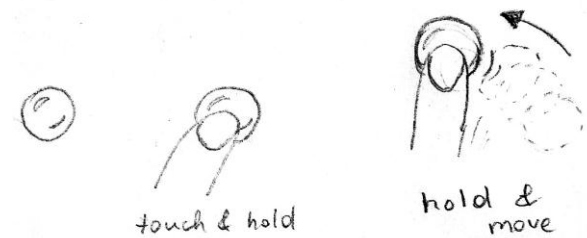


Figure 1. Take the bubble

This method is one of the simplest. The user just has to touch the bubble, hold it and then the bubble will be stuck on the finger when the finger moves. When the finger stops touching the display the bubble just stops its movement too. The advantages of this method are that it is very intuitive and easy to handle. It also works when there are lots of bubbles in the game because you select the bubble you want to move around by touching it. The player can fully control the bubble. But this can be also a disadvantage at the same time, as there is no challenge anymore.

Take the bubble and shoot



Figure 2. Take the bubble and shoot

This method is a variant of the first one. It just redefines the behaviour of the bubble after the user has stopped touching the display. Then the bubble will fly into the direction it has been thrown to by the user.

This method is very intuitive as it imitates what human are expecting of balls in the real world. The most advantages it has in common with the first method. But now the bubble is not fully controllable anymore and therefore it's more interesting and challenging.

This method can be tested in the App "Blosics".

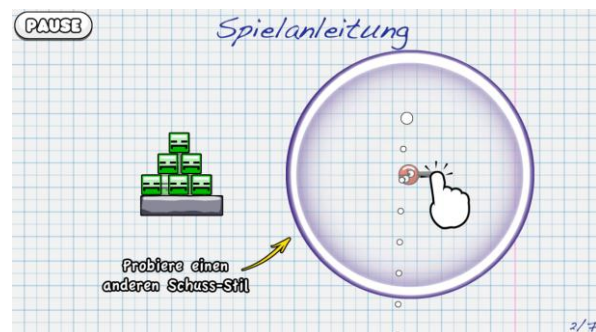


Figure 3. Screenshot from Blosics

BubbleShooter method

We called this method BubbleShooter method because in most versions of the popular game called BubbleShooter this method is used.

It is also a very simple version. The user just clicks at a position on the screen and the bubble flies into this direction. Most of the time the bubble may also fly farther away and does not stop at the specified position depending on if it has already hit an object or the boards.

It is intuitive, easy to understand and relatively accurate, because you can define the position where the bubble shall fly to and this position can also be farther away from the start position of the bubble.

But this method only offers the control over one specified bubble. But we have lots of bubbles flying around in our game. You could think about choosing the bubble first by clicking onto it and then it is active, but this would take too much time to be used in our game and therefore we won't use it.



Figure 4. BubbleShooter method



Figure 5. Screenshot from BubbleShooter

Slingshot

In this method there is a kind of slingshot involved which can be stretched out by touching it and moving it backwards. The user can define the direction by stretching it into different directions and he can also define roughly the speed of the bubble by stretching the slingshot more or less.

So there are lots of possibilities, but it's not very accurate and it can easily happen that the gamer unintentionally omitted the sling to early or that he moved his finger slightly just before he shot. Then the result can differ a lot from what he expected and wanted, which can be very annoying.

So this method requires a steady hand and a lot of patience.

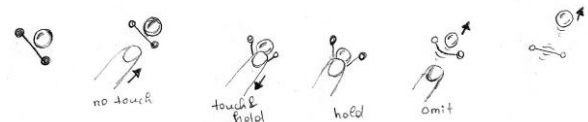


Figure 6. Slingshot method

To use this method it is not strictly necessary to have a slingshot, but a center point has to be defined. This center point is important for the calculation of the speed the bubble gets. This center point could be defined as the position of the slingshot or as the original middle point of the bubble.

If there is no slingshot in the game, this method may be difficult to understand and not very intuitive. The visualization of a slingshot can help the player to understand how the technique works and how he can use it, because he knows how a slingshot works. He can predict very well what will happen, because he sees the stretching. If there is no such additive, which explains why the bubble does what it does it may be confusing for the player. So you would have to show and explain him how it works, for example in a tutorial.

As we wanted our game to be self-explanatory and a slingshot would not fit into our concept we didn't choose this method.

An example for a game using a slingshot is Angry Birds.

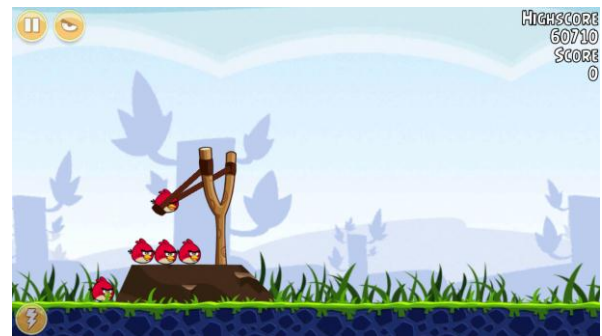


Figure 7. Screenshot from Angry Birds

The app Blostics offers this possibility to shoot an object without being dependent on such visualization.

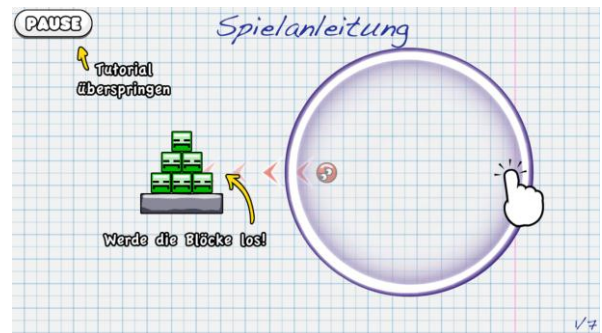


Figure 8. Screenshot from Blostics

A possibility to make this method more user-friendly could be an indicator, which shows you where the bubble would fly, if you would stop touching the display just in that moment. This indicator could also

show how the bubble would be reflected after it hit the first element.

Such a feature was integrated in the game “Peggle”.



Figure 8. Screenshot from Peggle; an indicator shows where the bubble will fly and how it will be reflected

Speed control depending on touch duration

In this method the direction where the bubble will head to is defined by a fingertip. The bubble will fly into the direction where the finger touched the screen, as it is common in other methods too.

But the speed of the bubble is defined by the duration of the touch on the screen. The longer the user holds its finger onto the display, the bigger the force which the bubble gets when it is shot. This can be for example visualized by a bar, whose indicator rises up while you touch the display.

It is easy to define the direction of the bubble very accurate, while it is nearly impossible to get exact the speed of the bubble you tried to get.

This method was totally unusable for our game for several reasons. To start with we had no space for an indicator. Furthermore the shot had to be performed quickly. The waiting time for increasing the speed would have been much too long. Moreover our game is a sidescroller, and therefore the position where the bubble should fly would have changed while the user touched the display. The bubble would move and so it would get very difficult where the bubble may fly and which objects it might collide with. And of course we don't have just one bubble, but many we want to shoot. Therefore the bubble may will have to be chosen to get active beforehand, which would take some more time.



Figure 9. Speed control depending on touch duration

Using controls

A completely different method to navigate a bubble is to use controls beside. There are plenty of different versions how the control instruments may look like

and how they can be adjusted. One of them is the one which is shown in the figure below. There the direction of the bubble can be set using a clocklike object, where a kind of watch hand defines the direction in degrees. This can be set directly by hand by rotating it through the middle point of the clock face or it can be set by using the up and down arrow buttons.

The speed can be visualized by a bar, which has an indicator which can also be readjusted either by moving the indicator by hand or by using the buttons.

This method can't be used in our game for several reasons, which are roughly the same as those why the method “Speed control depending on touch duration” is inappropriate. So we don't want to mention them again.

It takes very long to set the correct values, but the user has enough time and the possibility to achieve exactly what he wants. The buttons allow to set the values very accurate, while the direct input using the indicators allow quick changes. It's also not very intuitive as you can't interact with the bubble directly.

But there are lots of advantages which make it a perfect bubble controller, but not for our game. We could imagine a game where you have to send satellites into the space. There of course this has to be very accurate as small changes in angle and speed may have big influences onto the flight path of the object. Therefore also the design of the control buttons may be a benefit as they look very technical.

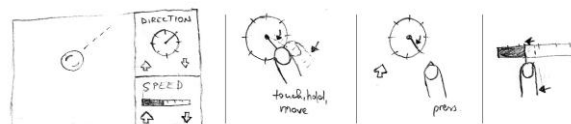


Figure 10. Using controls

RESULTS

We were really surprised how many different possibilities we found when we searched for them in apps. But when we had a close look at them we found out that lots of them just did not fit into our game concept.

Although we let some people test the different kinds of methods. As a result we found out that the method we described as “Take the bubble and shoot” would be the most appropriate method for our game, even though the bubble can't be controlled perfectly.

But we figured out that this is no problem at all as in our game everything has to be done quickly and therefore the user would not even find the time to try to make an precisely adjusted shot. Also there are no big problems if the gamer misses the object which he wants to shoot at once as he can try it again as long as the bubble is still there.

What we liked most about this method was that it is very intuitive and simple. This was important because we didn't want to be in need of a complex tutorial We wanted the game to be as self-explanatory as possible

because we know from our daily experience that users tend to ignore tutorials. Maybe that is because they just want to play and are not willing to read or have a look on anything.

In the end we were quite content with our game and also our testers were very satisfied.

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