

How to start implementing frozen bubble in PGE

- start by examining the bagatelle example
`examples/bagatelle/bagatelle.py`
- remove triangles, silos and pegs

How to solve the bubble freezing and unfreezing?

- these are code hints, they will need polishing and completing
 - this code has been used to implement the frozen bubble game

How to solve the bubble freezing and unfreezing?

```
#  
# bubble class which is used to record, colour, circle and children  
# children are bubbles which connect below the current bubble  
#  
class bubble:  
    def __init__ (self, cir, col):  
        self.circle = cir  
        self.colour = col  
        self.circle.fix ()  
        self.circle.on_collision (bubble_hits_bubble)  
        self.children = [] # no bubbles attached below this bubble
```

How to solve the bubble freezing and unfreezing?

```
#  
# addChild - adds bubble, b, as a child of self.  
#  
def addChild (self, b):  
    self.children += [b]  
#  
# removeChild - removes all bubbles in blist from the children field.  
#  
def removeChild (self, blist):  
    if self.children != []:  
        self.children = [x for x in self.children if x not in blist]
```

How to solve the bubble freezing and unfreezing?

```
■ bubbleDict = {} # allows us to obtain a bubble list from a pge circle  
  currentCircle = None  
  currentColour = None
```

How to solve the bubble freezing and unfreezing?

```
#  
# removeChildren - remove all bubbles in blist from all children in all bubbles.  
#  
  
def removeChildren (blist):  
    for circle in bubbleDict.keys ():  
        for b in bubbleDict[circle]:  
            b.removeChild (blist)
```

How to solve the bubble freezing and unfreezing?

```
#
# unfreezeList - unfreeze all bubbles in blist and return any children bubbles
#                 of these bubbles. Remove any reference to these circles/bubbles
#                 as they will be deleted as soon as they hit the bottom edge.
#
def unfreezeList (blist):
    todo = []
    for b in blist:
        print "bubble", b, "should be unfixed"
        b.circle.unfix ()
        if bubbleDict.has_key (b.circle):
            todo += bubbleDict[b.circle]
            del bubbleDict[b.circle]
        todo += b.children
        removeChildren (todo)
    return todo
```

How to solve the bubble freezing and unfreezing?

```
#  
# unfreezeAll - unfreeze all bubbles attached to circle (via children)  
#  
  
def unfreezeAll (circle):  
    global bubbleDict  
    blist = bubbleDict[circle]  
    while blist != []:  
        blist = unfreezeList (blist)  
    currentCircle.unfix ()
```


How to solve the bubble freezing and unfreezing?

```
#  
# bubble_hits_bar - the callback for the bubble hitting the top edge.  
#  
def bubble_hits_bar (o, e):  
    global bubbleDict, currentCircle  
  
    if currentCircle != None:  
        if bubbleDict.has_key (currentCircle):  
            print "odd the bubble is already registered"  
        else:  
            initChain (currentCircle, currentColour)  
    currentCircle = None
```

How to solve the bubble freezing and unfreezing?

```
#  
#  initChain - create an initial bubble in a chain of one.  
#  
  
def initChain (circle, colour):  
    global bubbleDict  
    b = bubble (circle, colour)  
    bubbleDict[circle] = [b]    # the first bubble in a chain is keyed via a circle
```

How to solve the bubble freezing and unfreezing?

```
#  
# updateChains - adds currentCircle/currentColour bubble to the chain specified by circle  
#  
  
def updateChains (circle):  
    global bubbleDict  
    print "updateChains"  
    blist = bubbleDict[circle]  
    print "blist", blist, "len (blist) =", len (blist)  
    blist += [bubble (currentCircle, currentColour)]  
    print "blistis now", blist, "len (blist) =", len (blist)  
    # and update all circle -> chain entries  
    for b in blist:  
        bubbleDict[b.circle] = blist
```

addBubble

- is only called when adding a bubble to an existing bubble chain.
- the bubble keyed by circle will be known and `currentCircle/currentColour` is the new bubble which is added onto the chain.
- you will need to implement this!

addBubble

- Prerequisite
 - circle is a pge object which has not been deleted.

- Postrequisite
 - assuming that circle is already known in the bubbleDict and if the collided chain has two bubbles of the same colour then unfreeze these bubble and their children. A same colour collision is appended to the chain. A different colour collision creates a new chain with a single bubble.

bubble_hits_bubble

```
#  
# bubble_hits_bubble - call back for a circle hitting a frozen bubble.  
#  
  
def bubble_hits_bubble (o, e):  
    global currentCircle  
    print "bubble hits bubble, currentCircle =", currentCircle  
    if currentCircle != None:  
        b = e.collision_between ()  
        for o in b:  
            if not currentCircle.is_fixed ():  
                addBubble (o)  
    currentCircle = None
```

unfix and is_fixed

- it would be useful to implement `unfix` and `is_fixed` in `pge`

- in order to achieve this we need to modify the following files
 - `pge/i/pgeif.i`
 - `pge/c/Gpgeif.h`
 - `pge/c/pgeif.c`
 - `pge/c/GtwoDsim.h`
 - `pge/c/twoDsim.c`

Layers and source files to be altered

- `pge/python/pge.py`
 - the user level python API file
 - this is the only PGE visible file to the user

- `pge/i/pgeif.i`
 - the swig interface (python calling C/C++ definition)
 - remember to edit both sections (C/C++ section and the Python section)
 - hint look for `%{` and `}%` delimiters

Layers and source files to be altered

- `pge/c/Gpgeif.h`
 - header file for `pgeif.c`
 - contains the external functions implemented inside `pgeif.c`
- `pge/c/pgeif.c`
 - its purpose is to allow, colours, polygons, circles, springs, to be given a unique integer
 - thereafter all references to objects will be achieved via the objects, `id`.
 - notice that inside `pge/c/twoDsim.c` colours and circles are different
- `pge/c/GtwoDsim.h` contains the prototypes and external declarations for `pge/c/twoDsim.c`

unfix hints

- in the five files mentioned on the previous slides
 - search for the `fix` function
 - duplicate it, and change the duplicate to `unfix`
 - adjust the implementation of the function (if necessary)
 - finally correct the comments!

- note that the file `pge/python/pge.py` will need a few edits to change the runtime checking
 - it currently checks to ensure that a `fixed` object has no mass
 - and a `fixed` object can not be given an acceleration/velocity
 - obviously this needs to be changed
 - in effect these checks need to be removed

pge/python/pge.py

- removing the checking code
 - the checking code is found in many methods and will look similar to

```
def velocity (self, vx, vy):  
    ...  
    self._check_not_fixed ("assign a velocity")  
    ...
```

Running your pge code

```
$ cd Sandpit/build-pge  
$ ./localrun.sh ../pge/frozenbubble/frozenbubble.py
```

- example of frozen bubble implemented with the above code in pge [frozenbubble.mp4](http://floppsie.comp.glam.ac.uk/pge/frozenbubble.mp4) \langle <http://floppsie.comp.glam.ac.uk/pge/frozenbubble.mp4> \rangle