

Gamification of a Recycle Bin with Emoticons

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Abstract— We introduce an emoticon-bin, a recycle bin that rewards users with smiles and sounds. We show that by exploiting human responsiveness to emoticons, recycling rates increase by a factor of x3.

Index Terms— recycle; game; bin; reward; emoticon; gamification

I. RECYCLING OF PET BOTTLES & AWARENESS

The consumption of plastic bottles of water in the U.A.E is 750 million bottles per year, and that ranks third highest in the world, but only about 10 - 12% of that is being recycled [1]. On the other hand, according to a survey by [2] in 2011, only 12.2% of UAE parents encouraged their children to recycle. By country, USA recycles 27% of all consumed PET bottles and Japan 77% [3]. Unfortunately, the PET bottles that are not recycled go to landfills damaging the environment. However, care for the environment is not the only motive to recycle. Table I shows the residual value of a typical PET bottle before and after being consumed [3]. In this paper we present a system that increases such recycle rates.

TABLE I. VALUE OF A 24G PET BOTTLE

Recycle Stage	Pre consumed	Post consumed	After hot wash
Value of PET plastic	 100% € 0.031	 50% € 0.015	 87% € 0.026

A. Review of previous recycle systems

Previously, several works tried to increase recycling rates by adding game elements [4], or by adding monitoring functions [5]. Others even use material incentives: ReVa is a reverse vending machine that rewards users with air-miles [6]. But so far, only [7] has combined a standard bin with smiles. The lid of the bin has a smiley face printed on it where the mouth is the aperture, however it is not interactive.

II. THE EMOTICON-BIN

A LCD screen, a proximity sensor and speakers were attached to a standard bin (by Masafi Co.). When a user drops a PET bottle the sensor fires and a Nintendo™ coin sound is played. Simultaneously, the screen will change from poker face to the Japanese emoticon for happy during 1 second. Fig. 1 shows a student recycling. Fig. 2 shows the components of a

PC-based implementation. An ultrasonic sensor is used as no-moving parts bottle detector.



Figure 1. Student recycling with emo-bin. The LCD poker face changes to happy each time a user feeds a bottle. Compared to a standard bin, recycle rates go up x3 times.

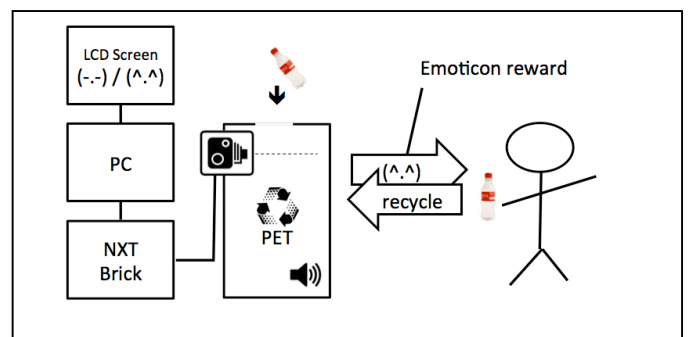


Figure 2. Emo-bin uses social rewards such as emoticons and audio cues.

III. EXPERIMENTAL RESULTS

For four weeks we measured the collection rate of a standard bin and an emo-bin. Fig. 3 shows an x3 increase in collection rates when emoticons and sounds are used. This is in agreement with the experimental results reported by [4]. In a subsequent test we tested user preference. Both an emo-bin and a standard bin were placed side-by-side in the College of IT lobby. Fig. 4 shows that after two weeks users overwhelmingly prefer to be rewarded with emoticons.

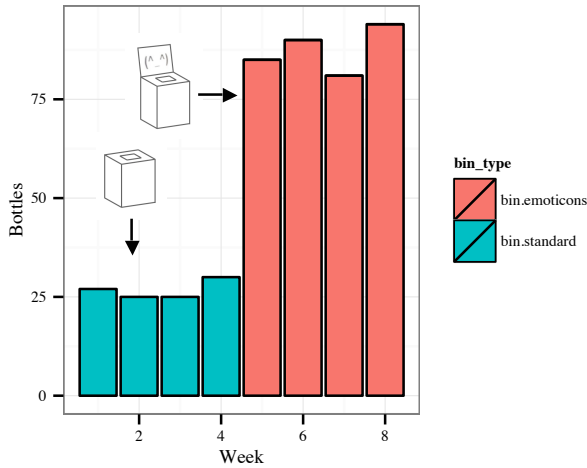


Figure 3. Comparison of collection rates of standard bin vs. emo-bin. Same location, different period. Periods measured: Standard bin, Sep 2nd to Sep 29th; Emo-bin, Sep 30th to Oct 25th. Location: IT building lobby.

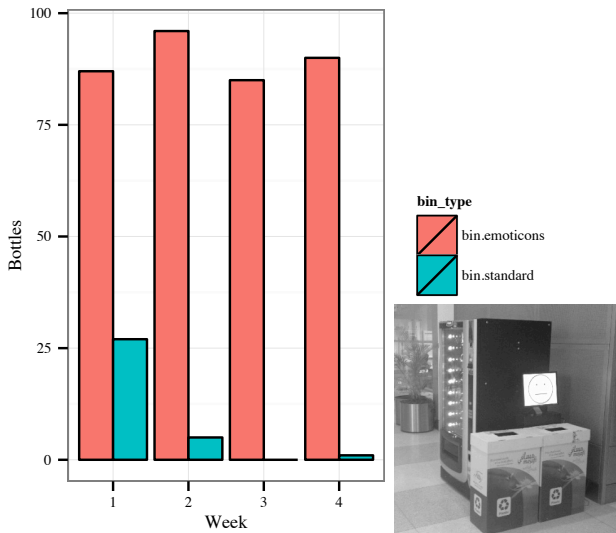


Figure 4. Comparison of collection rates of an emo-bin vs. a standard bin when side-by-side. Period: Oct 27th to Nov 27th. Location: IT building lobby.

IV. CONCLUSIONS

A. Social rewards vs. monetary rewards

Compared to existing products, emoticons and sounds from games are more effective than material incentives at effecting behavior change. This is in agreement with previous experimental data [6, 8-12]

B. Cost benefit analysis

How many bottles does the emo-bin need to collect in order to justify the electric bill? What is the payback time? If in place of a PC we use an Android tablet as shown in Table II, at a collection rate of 50 bottle/day, at 2012 PET recycled prices [3]




and at a kwh cost as per Table III then 11,613 bottles or approximately 8 to 12 months are required to recover a \$137 investment.

TABLE II. COST OF PARTS FOR A 9 INCH SCREEN BASED EMO-BIN

Part	Cost USD	Power Watt	Weight Kg
9 inch generic Android 4.0 tablet ^a	100	10	0.6
USB Infra Red bottle detector ^b	34	5	0.10
Total	\$ 134	15W	0.7Kg

a. Motorola Xoom. b. Azatrax MRD-U 2 with USB interface.

TABLE III. BOTTLES NEEDED TO OFFSET DAILY OPERATION COST

Country	UAE	USA	Germany
Bottles needed to offset 1day of electric bill			
Payback time @ 50 bottles/day	8.2 months @ \$0.05/kwh	9.0 months @ \$0.15/kwh	12.8 months @ €0.29/kwh

C. Concluding remarks

A novel bin that greatly increases the recycling rate by exploiting human responsiveness to emoticon and audio rewards was presented. Compared to a standard bin, it collects x3 more bottles. The source code is available at for download <https://github.com/orioli/emo-bin>.

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