AntiAccident for animals

Cover

Creative Engineering Design (SOC-1020), Spring 2020

Conceptual Design Project 2 - Design Report

“AntiAccident for animals”

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April 11, 2020

Executive Summary

This report details a conceptual design of a bracelet* **"AntiAccident for animals"**. The main role of the "bracelet" is to ensure the safety of animals, particularly domestic ones. Current design includes several features that are supposed to satisfy customer needs and requirements.

Report contains and explains all steps of the conceptual design processes:

- Gantt Chart
- Survey Results
- Design Parameters
- QFD Matrix
- Project Flow
- Conceptual Design Variables
- Decision-Making Matrix
- Final Design
- Self-Evaluation and Conclusion
- References

***** In fact, "bracelet" can also be considered as collar, earring or neckband, because of its various usage for various animals

Introduction

Animals are our companions, our workers, our eyes and ears, and our food. They appear in ancient cave paintings, and on modern commercial farms. We have domesticated some of them, while others remain wild and are sometimes endangered by our activities. They keep us company, and while they can provide comic relief, they also serve us as valuable assistants.[1]

However, some problems[2] related to their health and safety occur in our modern world:

- Lost ✓
- Accidentally injured or killed ✓
- Willfully injured or killed
- Stolen ✓
- Natural death
- Euthanized
- Illnesses

Current conceptual design aims to solve three of those listed issues, namely accidents, stealing and loss.

Here below there are provided some findings from the Internet which clearly indicate how serious the problems are.

The American Humane Association estimates that 1 out of 3 pets become lost at some point in their lifetime and close to 10 million dogs and cats are lost or stolen in the US every single year and according to the **Coalition for Reuniting Pets and Families**, less than 23% of lost pets in the U.S. are reunited with their owners.

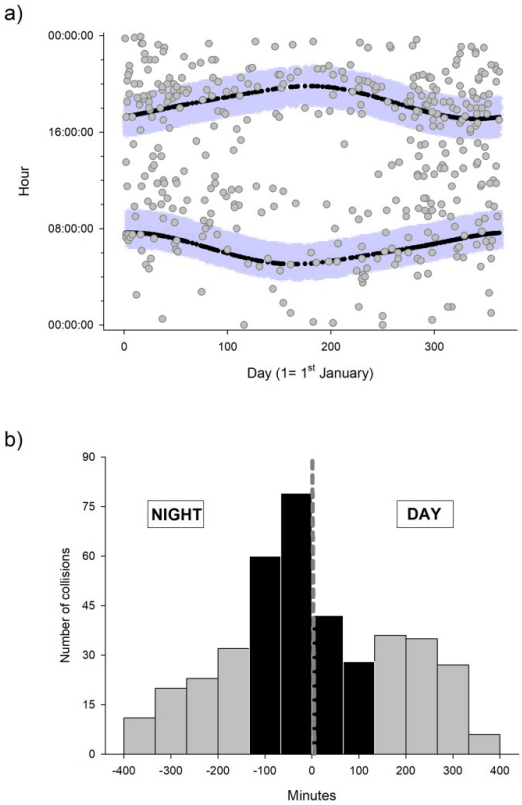
https://peeva.co/missing-pet-epidemic-facts-and-figures

Collisions with cars can involve domestic animals like dogs and cats, which may have escaped from their owners on a walk or from their home, or they could be strays.

Large animals like horses, donkeys and mules may be on the road being ridden by people or used in animal-drawn vehicles (like carts and carriages), or could have escaped from their field.

Agricultural animals like sheep, goats, pigs and cows may also break out of their fields and barns and present a danger to road users and themselves.[3]

Daily and annual distribution of the dog-vehicle collisions.[4]



a) Daily and annual distribution of the dog-vehicle collisions according to solar time of the day. Black curved lines indicate time of sunrise and sunset throughout the year, whereas blue areas show the periods around twilight with the highest collision risk as shown in the bottom graph (black bars in b). b) Distribution of dog-vehicle collisions in relation to the existence of natural light. Negative values on the x-axis of the graph indicate minutes in the absence of natural light (minutes until sunrise or after sunset). Black bars show the periods during and around twilight with high concentration of dog-vehicle collisions.

Background

There are number of measures implemented to save and take care of animals:

- Microchipping (to prevent loss)
- Installation of special warning traffic signs on roads (which are visible at night)
- Collars with ID (phone number and address of owner)
- Fences and Gates

In current conceptual design it is tried to apply and combine all above mentioned measurements in one “bracelet”. The features of the concept are executed from them and are *Night light reflection, Radio-frequency identification (RFID) microchip, Address Blank with owners ID* and *Flexible size.*

Night light reflection ensures animals safety at night, protecting them from traffic accidents, especially in areas without street lighting. *RFID microchip* - facilitates fast-searching in cases when animals are lost. *Address Blank* - provides information about an owner if a founder of lost animal wants to find him/her. *Flexible size* - ensures that bracelet is fitted for any kind of animal.

Gantt Chart

** Table 1

April 4	April 5	April 6	April 7	April 8	April 9	April 10	April 11
General Meeting		Meeting #1			Meeting #2		Meeting #3
Survey							Decision-Making Matrix
		QFD Analysis					Final Design Confirmation
		Conceptual Design Drafts				Digital Drawing	Presentation and Report Confirmation

** Due to emergency (COVID-19) all planned face-to-face meetings were transferred into online discussion/meetings (over Zoom and Telegram messaging)

Survey Results

In order to elicit the "Voice of Customer" (VOC) there were done phone calls* and Internet researches and surveys. Questions were formed to find out the main needs and requirements of customers about "bracelet".

Table 2

Customer Voice	Possible solutions
* Do not harm animal	* Using soft and safe material
* Manageable size control	* Using belt principle**
* Easy to put on/off	* Using "magnetic ruler" or "hair band" principles**
* Avoid interfere for movement	* Make lighter and smooth
* Waterproof	* Use waterproof material
* Aesthetic design	* Variable color options
* Affordable price	* Using cheaper materials
* Longer effective/application time	* Concentrate on quality and reliability

**
Belt principle for easy controlling the size

"Magnetic ruler" principle to avoid extra work to wear

* Due to emergency (COVID-19) all planned face-to-face surveys with pet owners were canceled

Design Parameters

Safety: Product should be safe for animals

Material: Material should be waterproof and soft

Weight: As lighter as possible

Cost: Affordable for all

Reliability: Should be with good quality/ long lasting

Aesthetics: Variety of colors

Functionality: Should be easy to manage, carry, and change(size)

Quality Function Deployment (QFD Matrix)

Table 3

	Material	Reliability	Safety	Weight	Functionality	Aesthetics	Cost	Σ
Harmless for animals	3	1	3	2	2	1	1	13
Size control	2	2	1	2	3	2	1	13
Easy to wear	3	2	1	3	3	1	1	14
Easy to carry (for animals)	2	3	3	3	2	1	1	15
Waterproof	3	2	1	1	3	1	1	12
Aesthentic design	3	1	1	1	1	3	1	11
Long application time	2	3	2	1	1	1	2	12
Affordable Price	2	3	1	1	2	1	3	13
Σ	20	17	13	14	17	11	11	

1 - not important

2 - medium

3 - important

The QFD Matrix showed that material type, reliability, and functionality should be implemented in concept design with the consideration that animal safety, wearing and carrying simplicity, size control and price of product are essential.

Project Flow

As the project was started late and designed in short time, Team 9 tried to work intensively and comprehensively.

First step into project began with General Meeting, where tasks were divided for all team members, namely Reports, PPT Presentation, Tables, Surveys, and Final Digital Drawing.

It was decided that all members should make surveys by calling to their relatives and friends who have domestic animals and search for more information on Internet. To the end of that day results were ready and design variables were chosen.

According to survey and website researches, it was found that animal owners are more concerned about safety of animals, that "bracelets" should be harmless. Simplicity of product usage was also important as most of the consumers wanted something easy to manage and carry. Another request from consumer side was quality of material. It was asked that material of product should be reliable, water resistant, and safe for animals. Price and aesthetics were also mentioned (Table 2)

When the extra features, like *Night light reflection, Radio-frequency identification (RFID) microchip, Address Blank with owners ID,* were introduced for customers, they welcomed them and were very happy as most of them had some problems and worries related to loss, accidents, and stealing.

After Customer Voice results were analyzed, design parameters were chosen:

Safety: Product should be safe for animals

Material: Material should be waterproof and soft

Weight: As lighter as possible

Cost: Affordable for all

Reliability: Should be with good quality/ long lasting

Aesthetics: Variety of colors

Functionality: Should be easy to manage, carry, and change(size)

Next step was to make QFD analysis (Table 3). In the matrix all design parameters and customer needs were included. To make comparisons and distinguish more significant parameters, it was chosen 3 scale assessment (1 - not important; 2 - medium; 3 - important). According to the importance and suitability scores were put. As a result, material type, reliability, and functionality should be implemented in concept design with the consideration that animal safety, wearing and carrying simplicity, size control and price of product are essential.

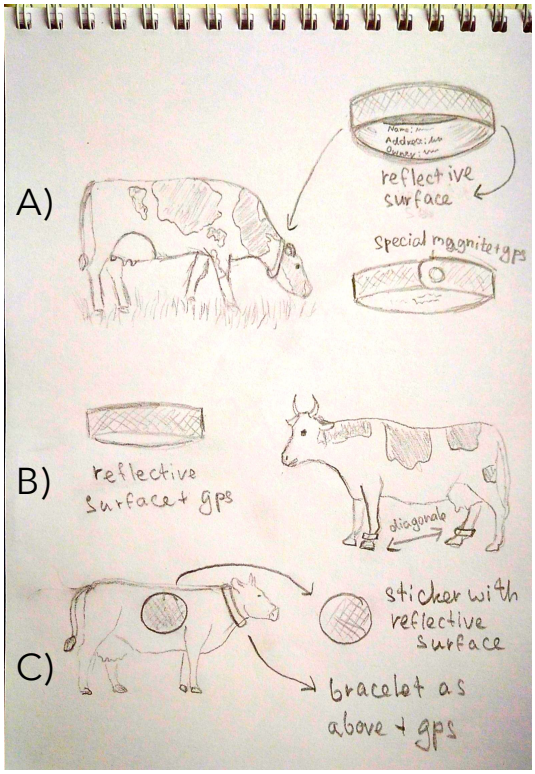
Further task was to start sketching design variables. Here it was decided to use the principle of CED class Activity (January 31, 2020) . There was given 4 hours to draw as much as possible design variable sketches and send it to Telegram group, where all members would explain the main features and basics of their own work. There were proposed many different options for the concept (Can be seen in the next section “Conceptual Design Variables”, p.13). All features (*Night light reflection, Radio-frequency identification (RFID) microchip, Address Blank with owners ID*) were included.

In order to chose the best concept design, there was done Analyzing Table (Table 4, p. 14). After calculations and discussion, Team has chosen to combine two sketches (they were almost similar). After that, suggestions from all team members were taken into consideration and some changes and improvements were added.

Next important step was to complete decision-making matrix and to draw final digital picture of the concept. According to the matrix, product should be harmless for animals and easy to manage and carry. Final digital draft was also drown (see p.16)

Conceptual Design Variables

Concept #1



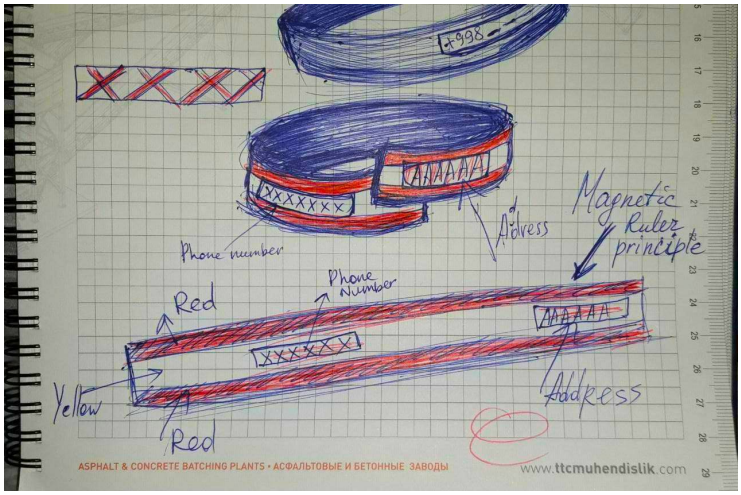
A) It is a collar for animals from a special material (not heavy and not rigid). Surface of the collar covered in material which will reflect light during nights. It is useful if animal lost during night time. That can prevent accident because drivers will see reflections of headlights. Also it has magnet to connect the ends. It makes this design suitable for different sizes of animals. Moreover, it has address of the owner on the back side. GPS chip will be inside the collar what makes it easier to find lost animal.

B) Bracelets for legs. They have the same functionality as previous one. But they will have to be installed on two legs of animal for clear visibility for drivers.

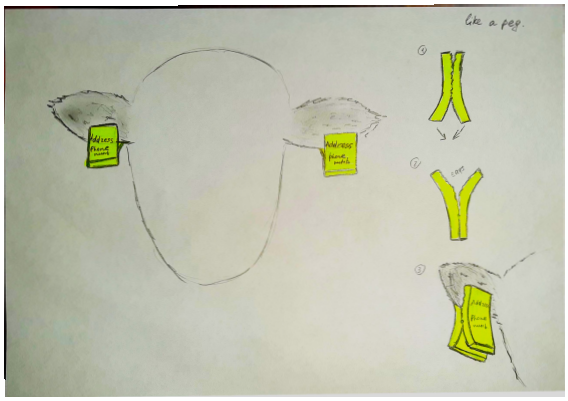
C) Stickers for animals. We didn't take that idea because of difficulties in installing.

Concept #2

It is a collar for animals from a special material (not heavy and not rigid). Surface of the collar covered in material which will reflect light during nights. It is useful if animal lost during night time. That can prevent accident because drivers will see reflections of headlights. Also idea of connection taken from "ruler bracelet". It makes this design suitable for different sizes of animals. Moreover, it has address of the owner on the back side.



Concept #3



They have the same functionality. They will work on the principle of earrings or peg**.**

Using the table below (Table4) team has chosen the best concept variables and tried to combine them to get the final design.

High scores were given to concept #1(A) and concept #2.

Table 4

Parameters	Concept 1			Concept 2	Concept 3
	A	B	C		
material type	**4**	4	1	**4**	4
reliability	**4**	3	2	**3**	2
functionality	**4**	5	2	**4**	3
animal safety	**4**	3	1	**4**	5
wearing simplicity	**5**	3	4	**5**	5
size control	**5**	4	3	**5**	4
price of product	**4**	4	4	**2**	4
carrying simplicity	**4**	4	3	**4**	4
SUM	**34**	30	20	**32**	31

Evaluation and Analysis (Decision-Making Matrix)

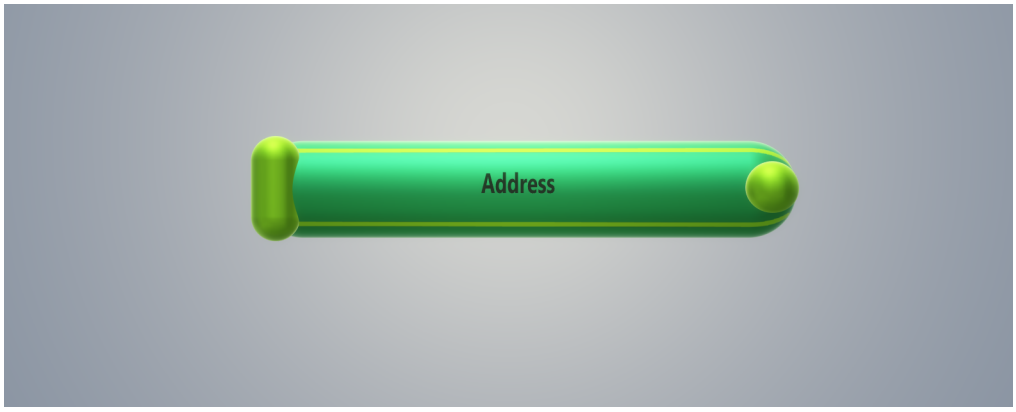
Evaluation Criteria	Weighted Value (1-3)	Evaluated value					Weighted value * Evaluated value				
		Harmless for animal	Size control	Easy to wear	Easy to carry	Price	Harmless for animal	Size control	Easy to wear	Easy to carry	Price
Reliability	**2**	3	2	2	3	3	6	4	4	6	6
Functionality	**2**	2	3	3	2	2	4	6	6	4	4
Material	**3**	3	2	3	2	2	9	6	9	6	6
Sum		**8**	**7**	**8**	**7**	**7**	**19**	**16**	**19**	**16**	**16**

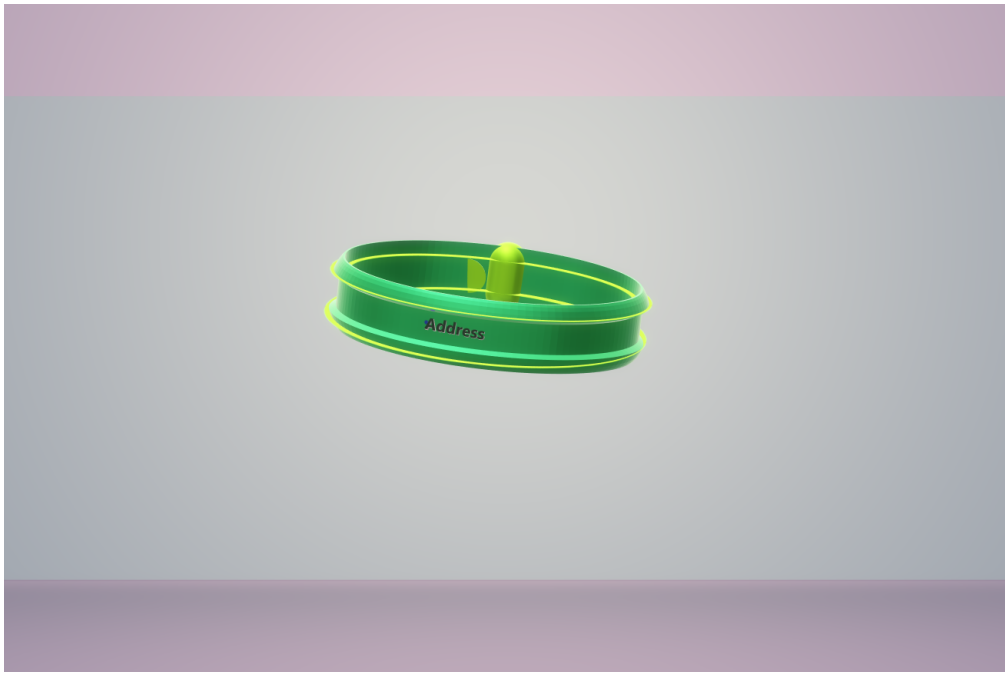
1 - not important

2 - medium

3 - important

Final Design





Current digital pictures were drown by one of the team members of Team 9 “Fulmine”

Self-Evaluation and Conclusions

Problems:

- Lost ✓
- Accidentally injured or killed ✓
- Stolen ✓

Are resolved by one single “bracelet”

In conclusion, Team 9 reached its goal, which was to find an appropriate solution for animals, particularly in rural areas.

We had several needs from potential costumer, such as do not harm animal, manageable size control, easy to put on/off, avoid interfere for movement, waterproof, aesthetic design, affordable price, longer effective/application time.

There was collar designed which has special surface which reflects light (protect against cars), RFID chips (in case of lost), comfortable design for animals (do not hurt them and flexible size) and address of the owner in case if someone else finds it.

Additionally, it can be suggested that current “AntiAccident for animals” would be useful not only for farm animals but also for pets (dogs or cats).

References

Page 1: https://unsplash.com/s/photos/animal (3 photos)

Page 4:

[1] https://sciencing.com/importance-animals-human-lives-5349359.html

[2] https://en.wikipedia.org/wiki/Animal_loss

Page 5:

[3] https://www.asdonline.co.uk/advice-centre/road-traffic-accidents-caused-by-animals-your-complete-guide

[4] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6157827/