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AN APPROACH FOR MIMICKING ROAD PLANNING AND CIRCULATORY SYSTEM IN HUMAN BODY

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Abstract

The idea of mimicking planning structures and human structure is used in this paper in a detailed way. Roads are one important side in planning as it represents the dynamic system through the circulation system. In this paper, there will be an identification to some definitions, hierarchy and

characteristics concerning the roads and street planning and there will be also an identification for the blood circulation in the human body presenting the definitions and hierarchy of blood in the circulatory system. Also there will be an analyzed part concerning the Mimics concluded from both sections the blood circulation in the human body and the road planning.

Keywords

Road planning, Circulatory system, Human body, Mimicking

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1. Introduction- Roads in the city (FDOT, 2011):

"Roads" are, generally, pathways dedicated solely for the purpose of travelling on, and are suitable for travel with vehicles. Paths intended strictly for pedestrians, such as trails, board walks, or promenades are NOT roads.

Modern examples of "pure" roads would include railways and limited access highways. In other words, in modern usage, roads are exclusive places for the movement of vehicles. Pedestrians are either not welcome on roads, or else they are second class users.

"Streets" are a uniquely urban phenomenon. Streets only exist in cities, towns and villages. Streets are public spaces which link private spaces together in an urban space, and are spaces through which we can also move people and goods through. As public spaces, streets are inclusive spaces.

As cities grow, roads can become urbanized and serve the purposes of streets without having their names changed. Some cities and towns may be planned with naming systems that designate roadways one thing or another without regard to their functions. Other roadways serve different purposes along different parts of their length and get different designations accordingly.

Now that roads and streets are defined, there must be definitions to the alleys, avenues, boulevards, circles, courts, drives, expressways, highways, lanes, parkways, paths, places, squares, trails, ways and other roadway name suffixes that are used. Here are some selected definitions (that aren't always followed):

Table 1 *Comparisons between Roads and Street* (FDOT, 2011)

Definition	Road	Street
In law	In law, many jurisdictions only have the idea of places where motor vehicles operating as roads (or as highways)	the roads vs streets movements are often indicative of the suburban vs rural divide we have in our modern cities.
In science	Roads run between two distant points — two towns, roads connect towns and cities for travel.	The term street, then, should be specifically applied to urban roadways. Streets connect people for interaction
Example	In each town, streets are found	It used to be the paving and the buildings that made a street
In real life	On the road connecting Town A to Town B, you're not likely to find any detailed services on both sides of the road.	On Main Street in a given town, have a sidewalk café.

1. Circulatory system:

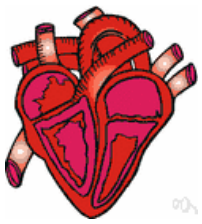


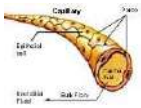
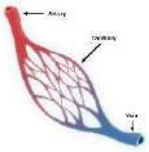
Figure 1: *Venous blood*

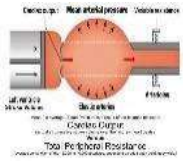
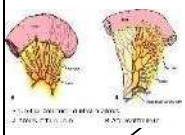
Cardiovascular system: the organs and tissues involved in circulating blood and lymph through the body Circulatory system: body, organic structure, physical structure the entire structure of an organism (an animal, or human being) (e.g. Neil et al., 2008). Liver : large and complicated reddish-brown glandular organ located in the upper right portion of the abdominal cavity; secretes bile and functions in metabolism of protein and carbohydrate and fat; synthesizes substances involved in the clotting of the blood; synthesizes vitamin A; detoxifies poisonous substances and breaks down worn-out erythrocytes Ticker, heart, pump: the hollow muscular organ located behind the sternum and between the lungs; its rhythmic contractions move the blood through the body; Blood stream: the blood flowing through the circulatory system (George & Carr, 2001). Lymph: a thin coagulable fluid (similar to plasma but) containing white blood cells (lymphocytes) and Chile; is conveyed to the blood stream by lymphatic vessels blood vessel :a vessel in which blood circulates (Gizurarson, 2012) Vein, vena, venous blood vessel: a blood vessel that carries blood from the capillaries toward the heart; "all veins except the pulmonary vein carry unseated blood (Maton, et al., 1993) Venous blood system, venation: (zoology) the system of venous blood vessels in an animal Lymph gland, lymph node, node : the source of lymph and lymphocytes Vascular system :the vessels and tissue that carry or circulate fluids such as blood or lymph or sap through the body of an animal or plant Fetal circulation: The system of blood vessels and structures through which blood moves in a fetus" road. (e.g. Neil et al., 2008).

2. Definitions to other roadway name suffixes versus Circulatory system:

Table 2 *Definitions to other roadway name suffixes versus Circulatory system*

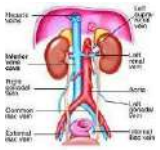
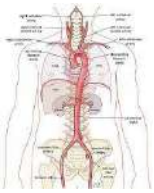
Roads in the city				**Circulatory system**		
Levels/ Hierarchy	***Definitions***	***Characteristics***	***Examples***	***Levels/ Hierarchy***	***Definitions***	***Examples***

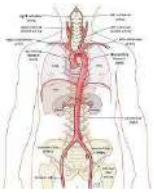
Alley	It is usually a narrow short road in a city environment, sometimes for pedestrians only, or only for delivery vehicles	Alley often provide access to the back of buildings, of the centres of city blocks. Alleys can be dead-end or through alleys. (FDOT, 2011)	 **Figure1:** *Pedestrian Alley with shops*	Capillary	Any of the smallest blood vessels connecting arterioles with venules and forming networks throughout the body)American College of Radiology& Neuroradiology ,2010(	 **Figure2:** *planning of Capillary*  **Figure3:** *design of the* *Capillary*
Avenue	It is traditionally a straight road with a line of trees or shrubs running along each side, which emphasize arrival at a landscape or architectural feature.	Avenue usually implied trees on the sides, and generally wider than streets. Avenues run perpendicular to streets. (FDOT, 2011)	 **Figure4:** *Fifth Avenue in New York is perpendic-ular to 47th Street in New York.*	Venules	Small blood vessels that merge with the veins and return blood from other tissues to the heart. (Dalley, Moore & Agur, 2010)	   **Figure5:** *planning of venules*

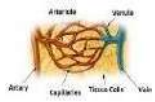
Roads in the city				**Circulatory system**		
Levels/ Hierarchy	***Definitions***	***Characteristics***	***Examples***	***Levels/ Hierarchy***	***Definitions***	***Examples***
Boulevard	is usually a widened, multi-lane arterial street with a median and landscaping between the curbs and sidewalks on either side.	Boulevards tended to be wide streets divided with a median. They may cut across the grid, and often tend to curve or wander. As Quora User points out, trucks are often prohibited or restricted on boulevards. (FDOT, 2011)	 **Figure6:** *Sunset Boulevard in Los Angeles*			
Court	It is a short street that ends as a cul de sac.	an area of ground wholly or partly surrounded by walls or buildings (FDOT, 2011)	 **Figure7:** *A cul-de-sac in Sacrament California*	end on arteries	 **Figure8:** *End on arteries* (Mineta, et al.,2003).	 **Figure9:** *End on arteries in the arteries plan*

Drive	It can be short for driveway, a private road for local access to one, or a small group of structures. Other times	Drive historically has its root in a cattle or sheep drive, and may connect to a commons or grazing area. Today it is usually associated with car travel, and	 **Figure10:** *Skyline Drive (mostly follows the crest of San Francisco eninsula), Lake Shore Drive in Chicago (follows the lake)*			

Roads in the city				**Circulatory system**		
Levels/ Hierarchy	***Definitions***	***Characteristics***	***Examples***	***Levels/ Hierarchy***	***Definitions***	***Examples***
	it refers to meandering, rather than straight, roads and highways.	a road the follows a contour of hills or a body of water. (FDOT, 2011)				

Express-way	It is a divided highway meant for high-speed traffic.	a highway especially planned for high speed traffic, usually having few intersections, limited points of access or exit, and a divider between lanes for traffic moving in opposite directions (FDOT, 2011)	 **Figure11:** *Chuo Express way*[1]	VenaCava Aorta	A blood vessel that carries blood from the capillaries toward the heart. He aorta distributes oxygenated blood to all parts of the body through the systemic circulation (Huijzen, Nieuwenhuys ,Voogd & van , 2007).	 **Figure12:** *venacava*  **Figure13:** *theAorta*
Freeway	It is a road designed for safe high-speed traffic through the elimination of intersections at the same grade or level. (FDOT, 2011)	an express high way with no intersections, usually having traffic routedon and off by means of a cloverleaf. (FDOT, 2011)	 **Figure14:** *Wyoming, Michigan*	vein Arteries	A blood vessel that carries blood from the capillaries toward the heart are blood vessels that carry blood away from the heart. While most arteries carry	 **Figure15:** *The vein*   **Figure16:**

Roads in the city				**Circulatory system**		
Levels/ Hierarchy	***Definitions***	***Characteristics***	***Examples***	***Levels/ Hierarchy***	***Definitions***	***Examples***
					oxygenated blood	*The arteries*
Highway	It is a main road intended for travel between destinations like cities and towns.	Reducing travel times relative to city or town streets, modern highways with limited access and grade separation create increased opportunities for people to travel for business, trade or pleasure and also provide trade routes for goods. Modern highways reduce commute and other travel time	 **Figure17:** *An Autobahn in Lehrte, near Hanover ,Germany*	Vena Cava Aorta	a blood vessel that carries blood from the capillaries toward the heart. (Neil et al., 2008). The aorta distributes oxygenated blood to all parts of the body through the systemic circulation (Farlex,2012)	 **Figure18:** *The vena cava*  **Figure19:** *The Aorta*

Lane	It is a narrow road or street usually lacking a shoulder or a median. (FDOT, 2011)	A Lane is a narrow road, usually in the countryside, but sometimes used in cities. In cities, Lane is sometimes used as a better sounding name for an Alley. (FDOT, 2011)	 **Figure20:** *Wild hare on a country lane in the UK*	Veinule arteriole	Small blood vessels that merge with the veins and return blood from other tissues to the heart. It is a small diameter blood vessel in the microcirculation that extends and branches out	   **Figure21:** *Veinule & arteriole*

Roads in the city				**Circulatory system**		
Levels/ Hierarchy	***Definitions***	***Characteristics***	***Examples***	***Levels/ Hierarchy***	***Definitions***	***Examples***
					from an artery and leads to capillaries	
Way	It is a minor street off a road in a town.	A Way is generally another method of saying road or street. In the US, it is often applied to short road that parallel a major road. Also used in housing subdivisions	 **Figure22:** *Way in Uk*			

Trail	Is generally applied to a road that was used before automotive travel, often to travel long distances. (FDOT, 2011)	It also applies to the path taken by animals. Gene rally winding. a path or track made across a wild region, ov er rough countr y, or the like, by the passage of people or a nimals.	 **Figure24:** *Cornwall, England, United Kingdom*			
Circle	It is a name given to circular roads, generally in housing subdivision s.	They are often more efficient than a signalized intersection, and they're safer. (FDOT, 2011)	 **Figure25:** *Roundabou ts Are Great But They Are Not Traffic Circles*			

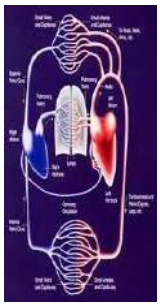
Roads in the city				**Circulatory system**		
Levels/ Hierarchy	***Definitions***	***Characteristics***	***Examples***	***Levels/ Hierarchy***	***Definitions***	***Examples***
Ring roads and Beltways	They are highways that circle large urban areas.		 **Figure26:** *A map of the Capital Beltway (red) around Washington, D.C., in Maryland (blue), Virginia (green), and the District of Columbia (orange)* 	Cardio Pulmonay	commonly known as CPR, is an emergency procedure performed in an effort to manually preserve intact brain function until further measures are taken to restore spontaneous blood circulation and breathing in a person who is in cardiac arrest. It is indicated in those who are unresponsive with no breathing or	 **Figure28:** *Roundabouts Are Great But They Are Not Traffic* (Mark , Connors, &Paradiso, 2007).

			Figure27 *São Paulo metropolitan ring road*		abnormal breathing, for example, agonal respirations. (Mtui, Turlough, Gerald& Gruener, 6th ed.).	

Roads in the city				**Circulatory system**		
Levels/ Hierarchy	***Definitions***	***Characteristics***	***Examples***	***Levels/ Hierarchy***	***Definitions***	***Examples***
Plaza or square	It is usually a wide open space. (FDOT, 2011)	In modern definitions, one of the above probably fits better for a plaza as a road. (FDOT, 2011)	 **Figure29:** *A statue of George Washingtn*			
Terrace	It is a raised flat area around a building. When used for a road it probably better fits one of the above.	UK, a close is similar to a court, a short road serving a few houses, may have cul de sac (FDOT ,2014)	 **Figure29:** *Terrace in italy*	capillary capillaries	any of the smallest blood vessels connecting arterioles with venules and forming networks throughout the body (Kandel, Schwartz& Jessell, 2012)	 **Figure30:** *capillaries* A statue of George Washingtn
Run	It is usually located near a stream or other small body of					

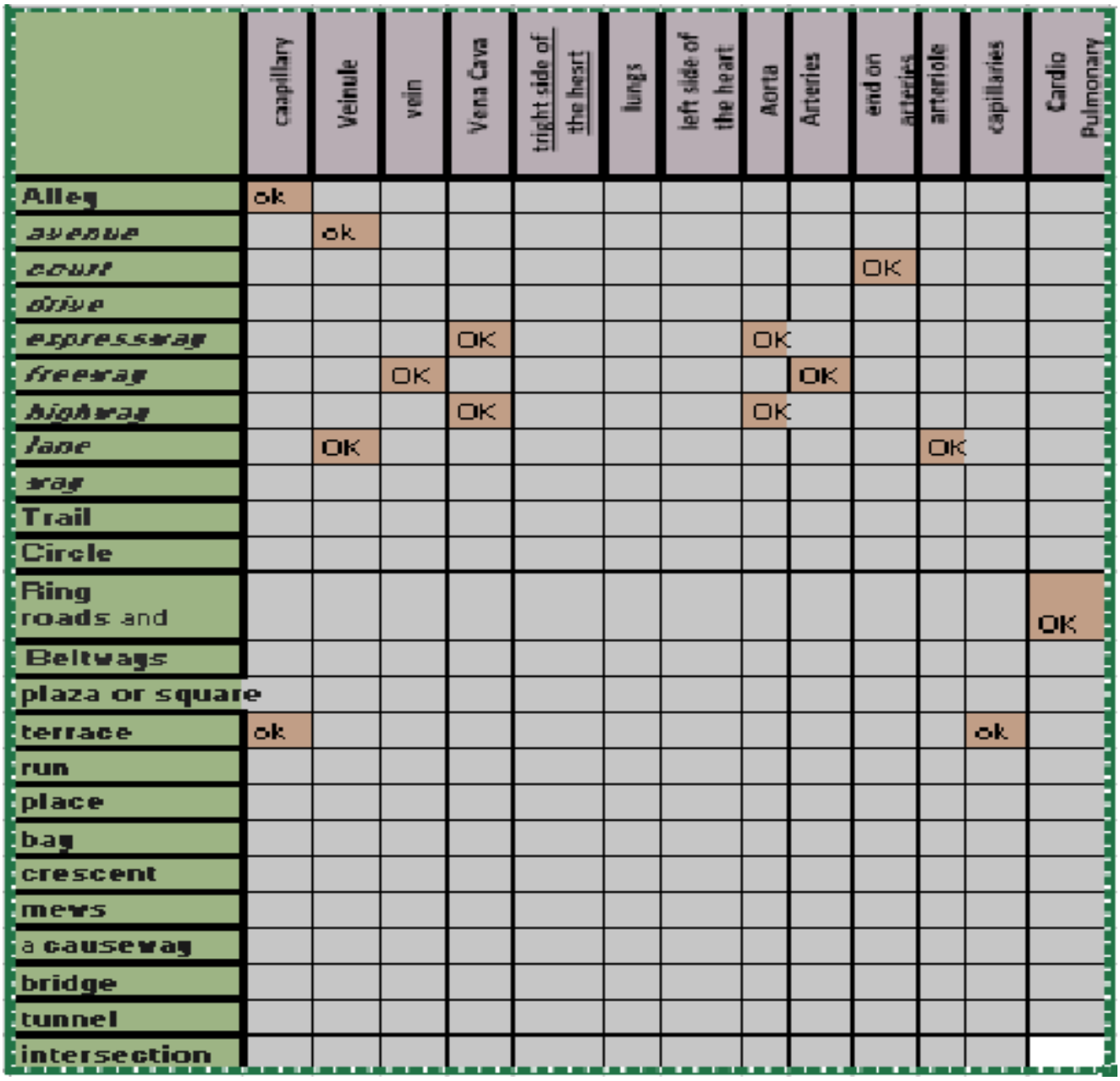
	water					
Place	It is similar to a court, or close	usually a short skinny dead end road, with or without cul de sac, sometimes “p” shaped (FDOT, 2011)				

Roads in the city				**Circulatory system**		
Levels/ Hierarchy	***Definitions***	***Characteristics***	***Examples***	***Levels/ Hierarchy***	***Definitions***	***Examples***
Bay	it is a small road where both ends link to the same connecting road					
Crescent	it is a windy "s" like shape, or just a crescent shape	(Datzma,2009)	 **Figure 31:** *From King George Boulevard to Bayview Street*			
Causeway	combines roads and bridges, usually to cross a body of water (Jacobson, 1990)	a raised path or road crossing water, marshland, sand, etc. (Butler, 1963)	**Figure 32:** *Pineda Causeway from US* (Google ,2011)			

3. Mimicking between roads & circulatory system

We concluded from the above study the following approach of mimicking between the roads and the circulatory system in the human body .It refers to similarity between the circulatory system and the kind of roads ,by function and shape ,this give us a lot of solutions for the roads problems which we mimicked it from the circulatory system .There are lot of similarities between the human body and roads like : At least we have found the following couple of similarities which are presented in table4 below: (Capillary & Alley) , (Venules & Avenue) , (end on arteries & Court) , (Vena Cava – Aorta &Express-way), (vein- Arteries & Freeway) , (Vena Cava- Aorta & Highway) , (Veinule-arteriole & Lane) , (Cardio Pulmonary & Ring roads and-Beltways); (capillary –capillaries & Terrace). We planning to study in detail each similarity in a forthcoming papers to discuss the properties and shape of both roads and circulatory system in details and how to benefiter of that in developing roads.

Table 4: *Mimicking between roads & circulatory system*



	capillary	Veinule	vein	Vena Cava	tright side of the heart	lungs	left side of the heart	Aorta	Arteries	end on arteries	arteriole	capillaries	Cardio Pulmonary
Alley	ok												
avenue		ok											
court										OK			
drive													
expressway				OK				OK					
freeway			OK						OK				
highway				OK				OK					
lane		OK									OK		
way													
Trail													
Circle													
Ring roads and													OK
Beltways													
plaza or square													
terrace	ok											ok	
run													
place													
bay													
crescent													
mews													
a causeway													
bridge													
tunnel													
intersection													

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