〈Summary of the Selected Master's Thesis〉

A Study on the Functions of Street as a Space for Activities :

with Special Reference to Street in CBD of Seoul

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CONTENTS

I. The Study

1. Introduction

The present study is about the outdoor space, the streets for pedestrian—sidewalks and/or paths—in which we can find a great variety of human activities which result from the interaction of people and their environment in the commercial area of the CBD in Seoul.

Rudofsky(1) in his *Streets For People*, argues for the necessity of humanizing the street for pedestrians. He uses European and Middle Eastern examples to illustrate what a street can and should be. In Seoul, it may be considered as an absurdity because of

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(1) Bernard Rudofsky, *Street for People*, Garden City, New York, Doubleday & Co., Inc., 1969, p. 19.

her resounding noise of construction work. Yet her old history and the complexity of various development activities in recent years tells us a lot about the necessity of faithfully cosidering "human" and "environment".

Because of the fact that there are so few places for the pedestrians to visit and relax, the streets tend to be used for multiple functions, in spite of the fact that it is not provided or designed originally for other acitvities than transportation flow and/or passage-way.

In order to analyze the multiple functions of the street which resulted from the various activities of pedestrians, it is the point of departure of this study that we conceive the street as a living space can be basically formed by the relationship between an object and a human being who participates in it.

For such an analysis, this study includes the surveys of the detailed land uses along the six selected streets, especially the use of facade which have direct contacts with the pedestrians, and the existing physical conditions of street for pedestrians, and the observation of various activities which were generated during a day.

2. Objectives of the Study

The objectives of the present study are: First, to formulate analogue models of the functions of pedestrian streets—sidewalks and paths—in varying environments; and second, to provide design criteria which include characteristics of space for the pedestrians' activities-conforming street functions in commercial strips in the CBD of Seoul.

In order to obtain above objectives, following hypothesis is formulated for the empirical testing: Genarally, the street is conceived of as a means of transportation passage and/or flow. However it is hypothesized in this study that, as the environment varies, the functions of a paticular street change. That is to say, depending on the environmental variables, the street functions not only as a milieu of transportation but also as a space for other activities including those usually associated with plazas, parks, markets or even cafeterias. These functions turn the streets into "places" to be visited for their own sake by pedestrians and not just passage-ways connecting an origin and a destination.

3. Scope of the Study

"Pedestrian street" means in this study as a space used or occupied by the pedestrian —sidewalks and paths. As mentioned previously, the pedestrian traffic is a function of activi ties concentrated in the CBD varing conditions of the environment; three environ-

mental variables are conceived as follows.

It is characteristic of the activities in the CBD that they take place along buildings, such as markets, and various kind of stores which for the purposes of this description can be termed "land use" as one of the environmental variables. The conditions such as width, street furniture that affect pedestrians' action or moving and give them a sense of enclosure can be termed "physical condition." The total environmental surrounding in terms of socio-economic characteristics of the street can be termed "district characteristcs". Besides above three environmental variables, "time" is termed as exogeneous variable in this study.

4. Methods of the Study

According to the hypothesis of this study, the study will be composed of three parts. The first one is a general theoretical studies of the functions of street to expose what the street is and how the people act on.

The second part is the analysis of the results of surveys and observation to empirically establish the relations between environmental variables and pedestrians' activities. The analysis is done through the process of comparison of phenomena on six selected streets under varying environmental variables.

The third part is the formulation of model which could prove the hypothesis and serve as the basis of street design vocabularies. The analysis of the survey data is done with respect to the variability of environment, the functions of street, and the activity patterns of the pedestrians. As to the variability of environment, analysis is carried mainly upon the facades of the buildings abutting the streets. Second, analysis of street functions is done in reference to the space enclosure; and finally, analysis of pedestrian activity is done in terms of the hierarchical activity classifications and traffic volumes.

The relationship among above three analysis constitutes the model of street function, and provide street design criteria which include the characteristics of street space. Within this context, the actual problems arising from the conventional concept that street is a milieu of the transportation flow is critically evaluated.

II. The Street

1. Concept of Street

Cities are accumulations of different urban patterns. Each of these patterns was

influenced not only by the previous form of the city and by its site, but also by the contemporary economic, social, political, and technological activity-systems of the inhabitants. Within all these patterns, travel has prevailed as a constant conditions of urban life. Yet the street is no doubt a greater supporter of urban life.

Colin Buchanan, in his *Traffic in Towns*, defines street as, "a form of lay-out consisting of a carriageway for vehicles, flanking pavements for pedestrians, and with frontage development with direct access to premises for pedestrians and occasionally for vehicles."(2)

Kevin Lynch has inquired into such distinctively urban phenomena as pedestrian movement in city streets, and the relationship of buildings of different uses as well as different sizes and shapes. He conceived the street as path and states: "paths are the channels along which the observer customarily, occasionally, or potentially moves. They may be streets, walkway, transit lines, canals, railroads. For many people, these are the predominant elements in their image. People observe the city while moving through it, and along these paths the other environmental elements are arranged and related."(3)

A more precise concept of street was developed by Martin & March in 1966: "The pavilion or tower, the street and the court. These can be considered within a rectilinear universe. The pavilion is finite in its plan form. The street extends, potentially, infinitely along one axis. The court extends infinitely along two. From these built forms rectangular lattices can be derived. In fact the pavilion, the street and the court constitute points of recognition in what may more properly be seen as a continuous transformation from one extreme to the other; from an array of isolated blocks elongated into continuous parallel rows, and these joined in the perpendicular direction to form a net of courts."(4) (see Fig. 2—1.)

Another attempt to conceive a street in the sense of space is in terms of a channel of urban space.

In this study, however, street is conceived as a corridor where buildings are arranged in continuous rows on both sides in urban area: and especially for the pedestrians, it is

(2) Colin Buchanan, "The Specially Shortened Edition of the Buchanan Report" *Traffic in Towns*, Harmondsworth, England, Penguin Books Ltd., 1974, p. 256.

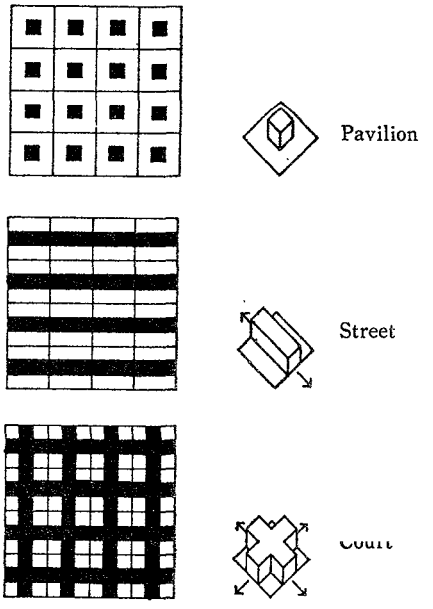
(3) Kevin Lynch *The Image of the City*, Cambridge, Mass., M.I.T. Press, 1967, p. 47.

(4) Leslie Marlin & Lionel March ed., "Cambridge Urban & Architectural Studies" *Urban Space and Structure*, Cambridge, Cambridge Univ. Press, 1972, pp. 35—39.

(5) cf. Paul D. Spreiregen *Urban Design: The Architecture of Towns and Cities*, New York, McGraw-Hill Book Co., 1965, p. 76.

conceived as a living space for sustaining human activites to cause or generate traffic.[6] That is to say, street is classified in terms of its functions under varying environmental conditions.

Fig. 2—1. Schematic Diagram of Street



Source: Leslie Martin & Lionel March ed., *Urban Space and Structure*, Cambridge, Cambridge Univ. Press, 1972, p. 36.

The conventional hierarchy of urban streets begins with the loop, cul-de-sac, or minor streets that give access to the low-intensity uses fronting on each house. The minor streets lead to the collector street, on which stand the local center, special small-scale activities, and moderate-density houses. The collector empties into the major arterial, built for heavy flows, with intersections at longer intervals, intensive fronting uses, and with access controlled but not excluded. Any moderate-intensity use on an arterial road will front into an intervening service road. From the arterial one enters the freeway, with widely spaced grade-separated intersections and no fronting access.[7]

Le Corbusier states his principle of the "Seven Routes", a refinement of a system long in existence in France. The seven routes are the types of surface circulation paths. They are designated V1, V2, V3, and so forth. The V1 route, for example,

(6) "Traffic" dedicates pedestrian traffic.

(7) cf.' Kevin Lynch, *Site Planning*, 2nd ed., Cambridge, Mass., M.I.T. Press, 1972, p. 128.

connects city to city. The progress of routes leads ultimately to the V7 which is a pedestrian pathway.

Street is a broad concept that includes various expression such as, foot-path, side-walk, alley, trail, pathway, lane, mall, highway, road, avenue, boulevard, route, and etc.. But the street under study here is not referring to the street used by vehicles only.

Generally, the street hierarchy is the concept of distributor roads connecting one to another though an orderly sequence of functions and importance, as the twigs of a tree connect to the branches, the branches to the limbs, and the limbs to the trunk. However, in this study, streets are classified within three hierachy: primary, secondary and tertiary, upon their right of way or width which carry respective functions. Additionally, the street hierarchy dedicates the priority between pedestrians and vehicles. The wider the street, the less the priority for pedestrians. According to the hierarchy of the street, each street carries its own function, through usually of multiple functions, through the activities of people on it.

There are two main requirements for pedestrian traffic or journey. First the pedestrians should be able to penetrate close to his final destination without any restricton. That is, he should be able to move in safety and with reasonable speed and directness. This can be translated as accessibility. "Accessibility" is a term used in this study to describe the general idea of ease of access for pedestrians as a visitors and/or passengers on the streets for pedestrian sidewalks and/or paths.

Second, on arrival in the vicinity of his destination or during his walking, he should be able to walk with pleasantness that attracts him and let him perceive the street as a livable space. This can be translated as amenity. "Amenity" is a term used in this study to describe the general idea of feeling pleasant and /or livable. It varies according to the conditions and/or situations of street and its environment including its ambience for pedestrians.

The two requirements, i.e., accessibility and amenity, tend to be in conflict. Man is different from motor as above mentioned. Especially, man as a pedestrian behaves not always rationally to take advantage of the "accessibility" or "amenity". He often undertakes unscheduled and/or stochastic activities, e.g., to walk while looking around or chat with friends by chance or aimlessly participating in the crowd around a speaker or seller.

In this study, however, street is conceived as a corridor in urban area with hierarchies

and it is provided as a living space for sustaining multiple activities.

2. Patterns of Human Activities on the Street

The analysis of human activities and the design of a pedestrian street requires a basic understanding of human characteristics and activity-patterns. The human inhabitants of the streets are different from vehicles in characteristics and scale. (see Table 2—1.). The physical dimensions of the human body (and psychological preferences of avoiding bodily contact with others) determine working widths of passage-ways. Most people can tolerate the close proximity of a stranger at their side, but not in front of them;[8] and this is a determinant of inter-person spacing in queues and other crowded pedestrian

Table 2—1. Summary of Man-Vehicle Characteristics

	MAN	VEHICLE
Size:	Small(toddler to adult variation).	Big (motor scooter to double decker bus variation).
Tactility:	Soft.	Hard.
Speed and Range:	Slow and small.	Fast (potentially) and great.
Momentum:	Slight, safe.	Great, dangerous.
Movement:	Organic.	Organic tendencies through driver only.
Rhythm:	Organic patterns, spontaneous.	Mechanical patterns, predetermined lines.
Routes:	No site lines, surprise, sudden changes.	Site lines and curvature and junctions according to speed and formulae.
Ecological:	Harmonious, basically in smell, sound, feel and waste products.	Petrol fuel disruptive to life. Poisonous, (carbon monoxide) carcinogenic agents, sulphur tri-oxide, ozone, eye, throat and nose irritation serious, destructive of plant life and many crops (Smog).
Sociological:	Needs security conducive to friendship and cooperation within narrow field and as a general characteristic.	Allows meetings of distant friends but where present is conducive to antisocial behaviour and disruptive of co-operative tendencies, particularly while driven.
Damage:	Care increases with damage. Injury and death irrevocable and therefore tragic.	Care decreases with damage. "Injury" and "death" means insurance, scrap heap and a new car.
	Average life, long.	Average life, short.

Source: Paul Ritter, *Planning for Man and Mortor*, Oxford, Pergamon Press, 1964, p. 10.

(8) cf., Robert Sommer, *Personal Space*, London, Prentice-Hall, Inc., 1969, pp. 26—38.

environments.

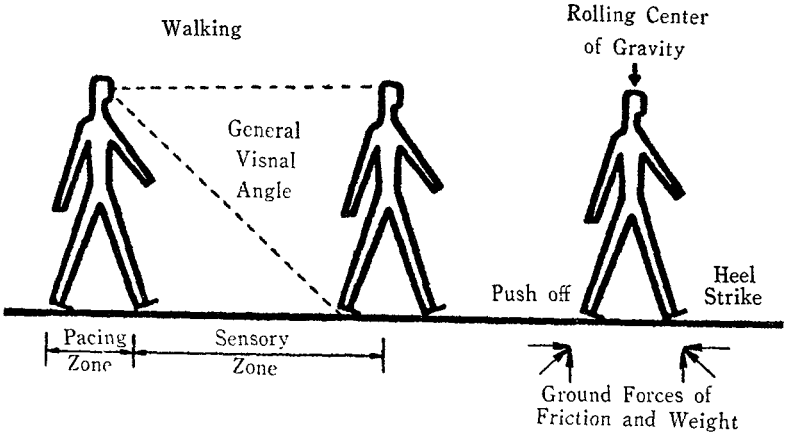
The detailed human activities under his various physical dimension is a determinant of street function. Normal human locomotion involves many complex characteristics of balance, timing and even human sight, which are often taken for granted by all but the handicapped.

Pedestrians also like to have a sort of buffer zones as his territory. The territory immediately around or in front of him is his claim to the surrounding space. A gallery goer can expect that when he is close to a picture, the patrons will make some effort to walk around his line of vision or excuse and/or minimize their momentarily blocking it. In this way, man is wishing to have his territory physically as well as mentally.

John. J. Fruin suggest twelve feet for social distance, between four to seven feet for close phase of social distance, four feet for personal distance[9] The concept of buffer zones also extends into other human activities. "The space required for locomotion may be divided into pacing zone, the area required for foot placement, and the sensory zone, the area required by the pedestrian for perception, evaluation and reaction." [10]

The length of the pacing zone is dependent on the age, sex and physical condition of the pedestrian, and has been shown to have a direct linear relationship with speed. Pedestrian pacing lengths may be physically measured, but sensory zone requirements are comprised of many human perceptual and psychological factors. (see Fig. 2—2).

Fig. 2—2. Pedestrian Pacing and Sensory Zone



source : John J. Fruin, *Pedestrian Planning and Design*, New York, Metropolitan Association of Urban Designers and Environmental Planners, Inc., 1971, p. 27.

(9) John J. Fruin, *Pedestrian Planning and Design*, New York, Metropolitan Association of Urban Designers and Environmental Planners, Inc., 1971, pp. 20—24.

(10) *Ibid.*, p. 25.

A walking-man as a pedestrian has patterns of rhythm in his movement which are created not only by curvature itself but also by incidents which simulate curvature along the line of movement. The tendency is often compared to the movement of ameboid. (see Fig. 2—3.) Man's movement is different from other directional movement. For example, in a small boys's case, he is not willing to walk direct but walk meanderingly in spite of his ineffective point-to-point movement.

Fig. 2—3. Ameboid Movement of Pedestrian

source : Paul Ritter *Planning for Man and Motor*, London, Pergamon Press, 1964, p.21.

An activity causes or generate traffic. In human daily journeys, people as pedestrians move on the street with various activities which can not be obtained from the O-D survey. However, in order to analyze the activities on the street, we conceived it in this study in terms "Activity System", including sub-systems-activity agents, activity patterns, activity types under seven classification. Those are objective of movement, grouping, speed, motion, posture, trace, and incidental load: Which has second classifications include five elements under the intensity of activity of each first classification.

The sentence "They are cooking apples" can mean either "(They are) (cooking apples)" or "(They) (are cooking) (apples)", and which it is made clear only at the higher level grouping into phrases, lists of phonemes (the smallest units of speech) or of morphemes (the smallest meaningful units) would not indicate which meaning was intended.(11)

The analysis of activity in this approach begins at the pedestrians to describe activity in detailed elements of classification, and requires more remarkable identification of pedestrian movements and behaviour. However, in this study, observation of tracing of pedestrians is used to build the activity system.

(11) W. Mary Woodward, *The Development of Behaviour*, Harmondsworth, Penguin Books Ltd., 1971, p. 28.

3. Relationship between Environment and Human Activities

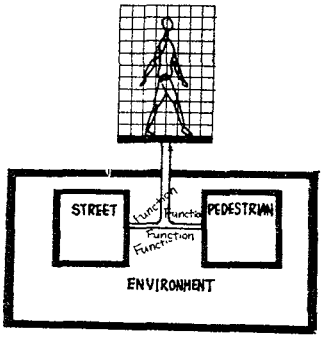
Above descriptions are about the street system and the human activity system. Thus, this section is to link the two systems in the physical sense.

The chain and/or linkage between the two fixed and moving systems—street and pedestrian—is the function of the environment. (see Fig. 2—4.)

Concentration of special uses or activities along a street make pedestrians enjoy visiting such street, for people are sensitive to variations in the amount of activity they encounter. Sometimes they are even lured by the main stream of traffic. Other kinds of activities on the ground level also make places memorable, such the intimate and recreational activities we can find along the Myeong-dong or Moogyo-dong (Seorin-dong). These kind of "district characteristics" is a unpredictable variable to generate special activities.

Facade charactristics upon the "land use" is also important variable to be a path identity and generate the activity which formulate the functions of street.

Fig. 2—4. Relationship between Street and Pedestrian.



Characteristics of spatial qualities e.g., the sense of enclosure, are also able to strengthen the activities of particular streets or paths. In the simplest sense, streets that suggest extremes of either width or narrowness and the conditions of street furniture that are "physical condition" attract attention and make the pedestrians activities be different from other street.

The path system affects communication between people. The function and the linkage between man and environment increase the "entropy" which is the criterion of communication. (12) In the residential area, one prime way to encourage contacts between

(12) cf. Richard L. Meier, *A Communication Theory of Urban Growth*, Cambridge, M.I.T. Press, 1970, pp. 144—248.

neighbors is to let their dwellings open on a common pathway. Friendships are made along the street rather than across the park. On the commercial strips, show-windows or various exhibition booths can encourage the pedestrians to visit or drop into and increase the "entropy" of communication between the shops and pedestrians.

In short, the function is understood as a linkage between environment and pedestrian based upon activities. It was not to argue about the generators between two—environment and pedestrian—but the relationship and the linkage or catalyzer to increase "entropy" between two. Another problem here is the generator between the two—enviromental variable or environmental condition and pedestrian activity.

The CATS[13] concept is familiar to the origin-and-destination concept of transportation planning. But the problem of this appoach is that an existing city form and its likely extension may to be good. It may be that a better design is possible than the one which enlarges upon an existing pattern.

In this study, it is not to determine which side—pedestrian activity or environment—is the generator of others. For the analysis of street function, the surveys and observation are fixed upon the existing condition of environment and to see changeable activities upon it. Therefore, at the point of designing the street, it has to include the pedestrian activity.

In short, after finding out the environment-conforming functions of the street, we can design the activity-conforming environment and street itself.

Ⅲ. Analysis

1. Outline of Analysis and Street Profiles

The basic objective of analysis is to see if the relationship between the street environment which includes"land use", "district characteristics", "physical conditions" and the pedestrian activities can be explained in terms of analogue models of the street functions.

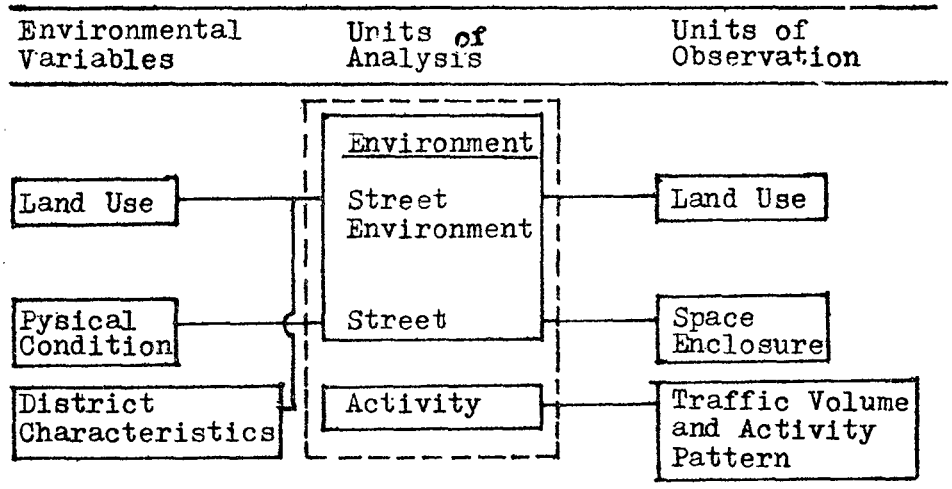
The fundamental assumption is that, the pedestrian activity patterns are changing because of varying street environments, and therfore, that the typology of activities determine the functions of the street.

(13) cf. Paul D. Spreiregen, *op. cit.*, p. 168.

Before beginning the analysis, it is necessary to determine the terms of analysis and relationship amomg the environmental variables, and the units of analysis and of observation. (see Fig. 3—1.)

Through the preliminary survey, six streets are chosen as M.1, M.2, M.3, S.1, S.2, S.3, (M. represents Mixed Commercial Street, S. represents specialized Commercial Street.)

Fig. 3—1. Relationship among Environmental Variables, Units of Analysis, and Units of Observation.



.M. 1, S. 1: wide street (48.5m. 38.5m)

.M. 2, S. 2: medium width street (15m, 8.4m)

.M. 3, S.3: narrow width street (7.2m, 3m)

.M. 1, S. 1: primary distributors

.M. 2, S. 2: secondary distributors

.M. 3, S. 3: tertiary distributors

.P (M.1) P (M.2) P (M.3)

.P (S.1) P (S.2) P (S.3)

P=priority for pedetrian

M. and S. are classified on the basis of two criteria. That is, intensity the index of which is floor space, especially the ground floor (in the preliminary survey, it was numbers of shops); and district characteristics whose index is major activity and land use of street environment the index of which is major commercial land use pattern, e.g., fashionable and /or recreational district, Myeong-dong, drinking place of Moogyo-dong, and East Gate market surrounding Chongro-5-ga. (see Table 3—1.) Overall street introduction is described in Table 3—2.

2. Typology of Environmental Variables

The environmental variables which affect people on the street are "land use", "physical condition", and "district characteristics". Land use includes the use of land or building site; physical condition", refers to the existing conditions of street, i. e., width, street furniture, paving. And finally, district characteristics is derived from the common or usual characteristcs of the street environment.

Table 3—1. Classification of Selected Street

M.C.S.	S.C.S.
1. M. 1—Chongro-2-ga	S. 1—Chongro-5-ga
2. M. 2—Moogyo-dong	S. 2—Myeong-dong
3. M. 3—Soopyo-dong	S. 3—Seorin-dong

Table 3—2 Street Profiles.

Street characteristics	M.1	M.2	M.3	S.1	S.2	S.3
facade building or land use	Commercial	Business Commercial	Commercial	Commercial	Commercial	Commercial
attractive land use patterns of district	/	/	/	East Gate market	Myeong-dong district	Moogyo-dong -district
street width(m)	48.5	15.0 17.3	6.8 8.0	26.5 42.3	8.4	2.8 3.5
sidewalk width (m)	6.5	3 5.3	/	5.3 8.5	/	/
Average building height (no. of storeys)	4	4	2	3	3	1
peak hour traffic flow (peds/hour)	16253	9449	10852	9359	19055	5304

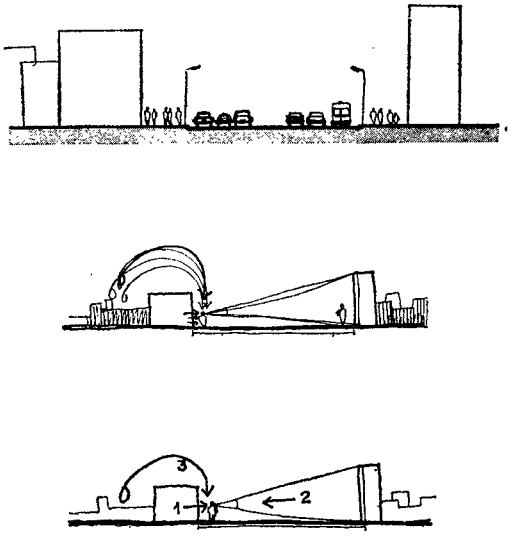
Above environmental variables are interrelated and together constitute the characteristics of a particular street. (see Fig. 3—2.)

Thus, these variables do not affect the pedestrians separately but convergingly.

A. Land Use

Land use is a term used in contemporary urban planning studies as a spatial distribution of city functions—residentrial, industrial and business uses, and etc.. Because of the great variations among different uses, it is necessary to classify and record land and space use on a systemic basis. Classification is a systematic means of grouping similar uses

Fig. 3.2. Environmental Variables



1. Land Use
2. Physical Condition
3. District Characteristics

in the same category.

Especially, a pedestrian has the limit of perception in terms of his optical vision. His two eyes have a general field of view, 30° up and 45° down, and 65° to each side. Moreover, in the distance of width of sidewalk or path, he is apt to perceive the first floor shops as the whole street characteristics. Thus, people tend to choose the shop at the first floor.

From such a point of view, the analysis of street environment has to meet two requirements: need of detailed land use classification for analysis of the chosen streets in the CBD (Table 3—2.) and pedestrians' activity in the CBD strongly depends on the use of the first floor area.

Murphy and Vance have carried the concept of "Height Index" and an "Intensity Index". The former refers to the ratio of space on all floors devoted to a particular class of use to the total ground floor space, and the latter being the ratio of space on all floors devoted to a particular class of use to the total floor space on all floors.[14] Conceivably, these concepts could also be applied to the terms of commercial intensity index

(14) cf. Jack P. Gibbs, *Urban Research Methods*, New York, Van Nostrand Co., Inc., 1961, pp. 213—218.

for the analysis of comparison between streets.

In this study, we define C.I.I. (Commerical Intensity Index) as follows:

$$\text{C.I.I.}=\frac{\text{total ground floor space used in paticular classification}}{\text{total ground floor space}}\times 100$$

B. Physical Condition

In this section, it is necessary to remind the assumption that the street is space. In order to have a sense of space, it is necessary to have an enclosure. Generally, peoples' activity are different in different space enclosures.

The intensity of enclosure is determined by the angle from the line of the forward horizontal sight.[15] Besides the building height and width, the condition of the street furniture, e.g., lights, plants, booths, etc., affects the sense of enclosure.

C. District Characteristics

Street environment's characteristics affect the pedestrians on the street, because the major attractive function of particular district can be a main element to generate the trip.

District characteristic is applied to the classification between "specialized commercial street" and "mixed commercial street" besides the facade land uses. Especially in "specialized commercial street", e.g., S.1 (Chongro-5-ga street), S.2 (Myeong-dong street), S.3 (Seorin-dong path), there are special characteristics as market-street, fashionable and/or recreational path, and for drinking and recreational path.

Besides above three environmental variables, "Time" is conceived as exogeneous variable which influences hourly changes of weekdays' phenomena.

3. Analysis of Environment

Analysis of environment—pedestrian street environment—is based on the surveys of land uses. For aforementioned reason of finer land use classification, "land use coding system in the study" (see Table 3—3.) is applied to the analysis.[16]

Land use survey was carried along the building lines and the facade buildings or lots. The analysis is based on the comparison of C.I.I. (Commercial Intensity Index).

(Table 3—4.) illustrates the tendency of each street of the fact that specialized commercial streets generally have high intensity. Among the specialized commercial streets, the more intensive the narrower the width of the street; and numbers of land use classifica-

(15) cf. Paul D. Spreiregen, *op. cit.*, p. 75.

(16) cf. Stuart F. Chapin, *Urban Land Use Planning*, 2nd ed., Urbana, Univ. of Illinois Press, 1965, pp. 278-281.

tions are not more than the wider street. However, the C.I.I. of a particular kind of land use was high. (Figure 3-3~3-8.) shows C.I.I. of six streets more precisely.

Table 3—3. Land Use Coding System

	Activity System and Two-Digit Land Use Coding System	General Coding System
1.2.3.	Distribution Activities	
10	Wholesale trade	50.51
11	Retail trade—eating places (restaurant, bakery, cafeteria)	58
12	Retail trade—drinking places (wine shops, liquor stores)	58
13	Retail trade—coffee-shops	58
14	Retail trade—foods-shops	54
15	Retail trade—department stores	53
16	Retail trade—general merchandise	53
17	Retail trade—drug stores	59 or 68
18	Retail trade—miscellaneous retail stores and cigarette stores	59
19	Retail trade—flowers and seeds stores	54
20	Retail trade—dress shops, salon, and foreign-goods shops	56
21	Retail trade—linen, silks, and satins shops	56
22	Retail trade—shoes and baggage shops	56
23	Retail trade—cosmetics and accessaries shops	56
24	Retail trade—jowelry shops	56
25	Retail trade—glasses shops	56
26	Retail trade—books stores	59
27	Retail trade—writing and drawing materials stores	59
28	Retail trade—materials of barber's and beauty shops	59
29	Retail trade—special local products shops	56 or 59
30	Retail trade—musical instruments and related material shops	57 or 59
31	Retail trade—sporting apparatus shops	57 or 59
32	Retail trade—furniture, home furnishings, toys, handicraft articles shops	57
33	Retail trade—electric, electronic equipments	57
34	Retail trade—building materials, hardware and farm equipments	52
35	Retail trade—car dealers, auto accessories	55
36	Retail trade—gasoline service stations	55
37	Retail trade—general merchandise	53
38	Retail trade—chemicals or industrial use medicines	52
39	Retail trade—paper goods stores	52

Activity System and Two-Digit Land Use Coding System		General Coding System
4. Service Activities		
40	Firm headquaters and other official uses	60
41.	Finance, insurance, and real estate	61
42	Personal services—various works offices, e.g., architectural design and law offices	62
43	Personal service—beauty parlors, barber's shops, and laundries	62
44	Miscellaneous business services-printing, copy work	63
45	Miscellaneous repair services	65
46	Automobile repair and services, metered or fee parking lots and garages	64
47	Commercial amusement services	66
48	Travel information services	66 or 60
49	Hotels	67
5. General Welfare, Community Service, and Non-commercial Leisure-time Activities		51
51	Educational institute, Libraries	70
52	Hospitals, herbs	74
53	Churches and other religious services	73
54	Art galleries, museums, historical sites	71
55	Playgrounds, parks, and related open space.	72
56	Police, fire services, telephone, post office, and community services	75. 76
57	Governmental services	76
58	Service and welfare, organizations and their headquarters	77
59	Nonprofit membership groups	78
6. Residential Activities		8
7. Processing Activities		2. 3
8. Communication Activities (including the excluded activities in 4 and 5)		4
9. No Activity (unoccupied for sale or under construction)		

Fig. 3—3. Land Use Classification : Commercial Intensity (S.1)(S.2)(S.3), (M,1)(M.2)(M.3)

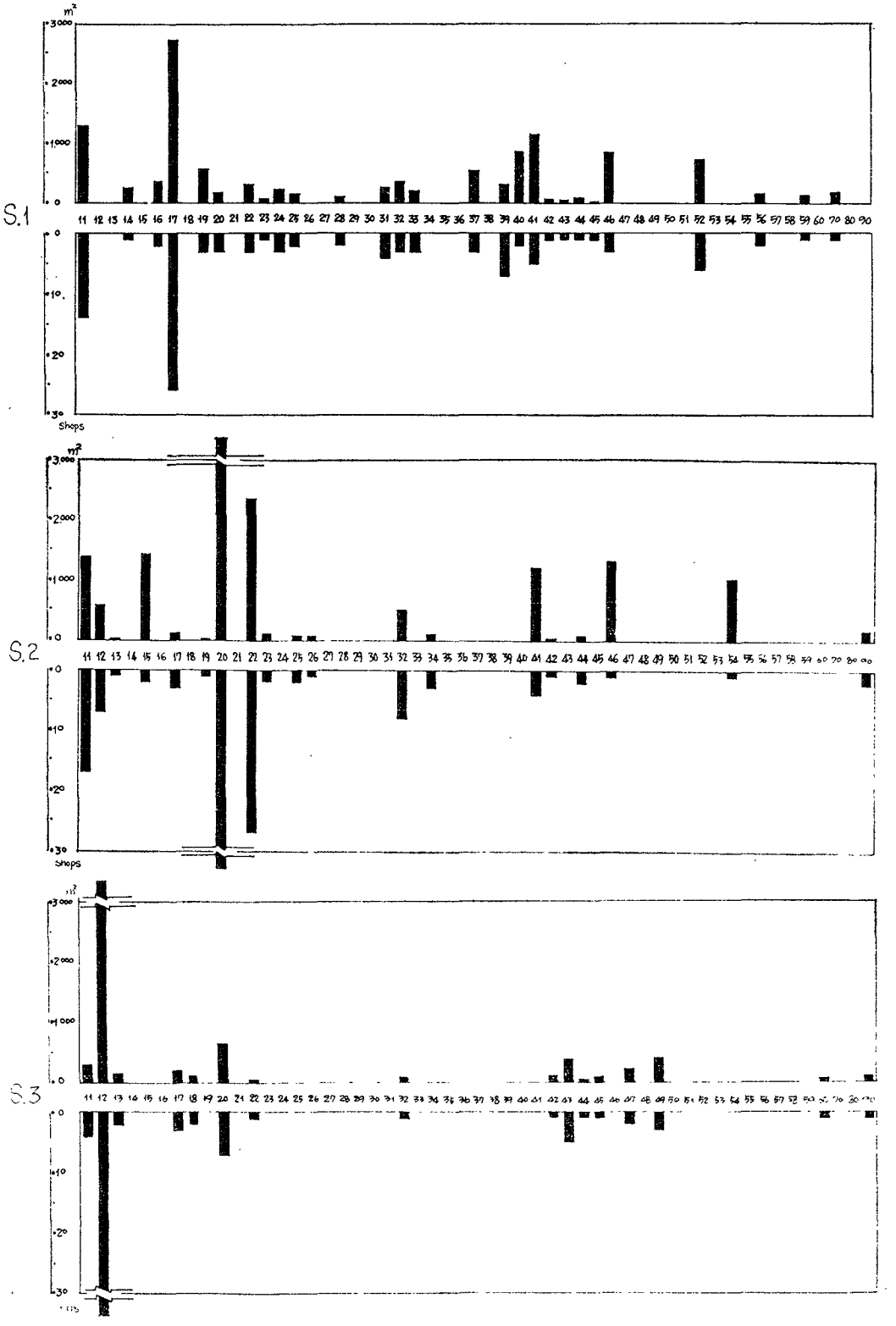


Fig. 3—3. (Continued)

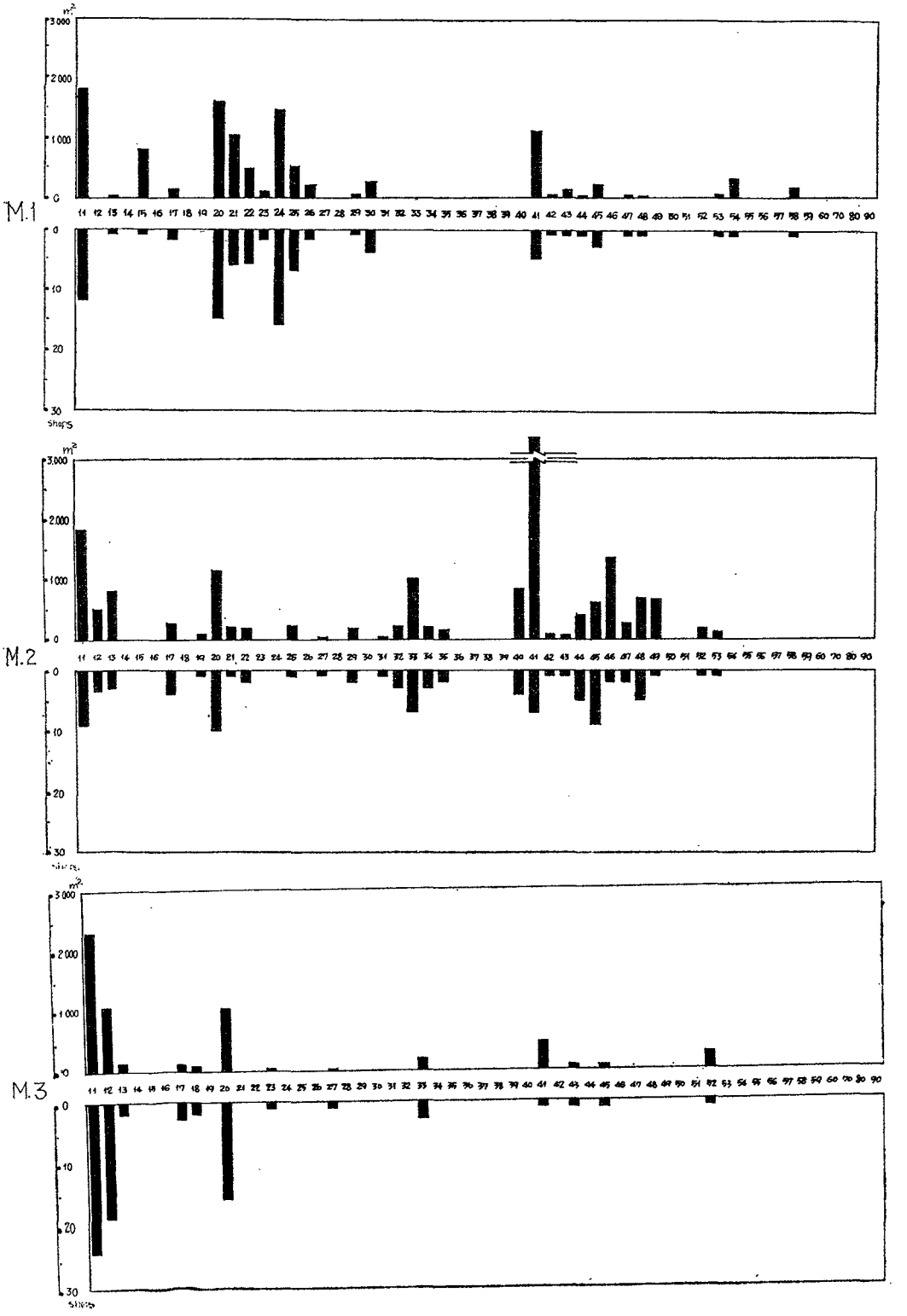
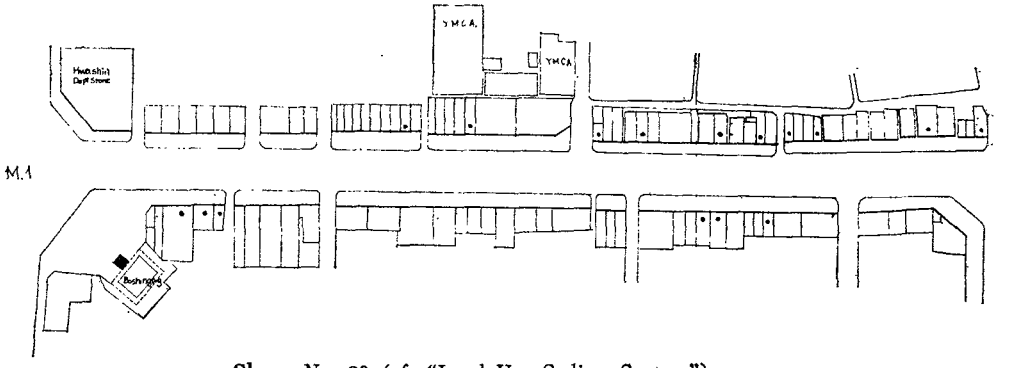
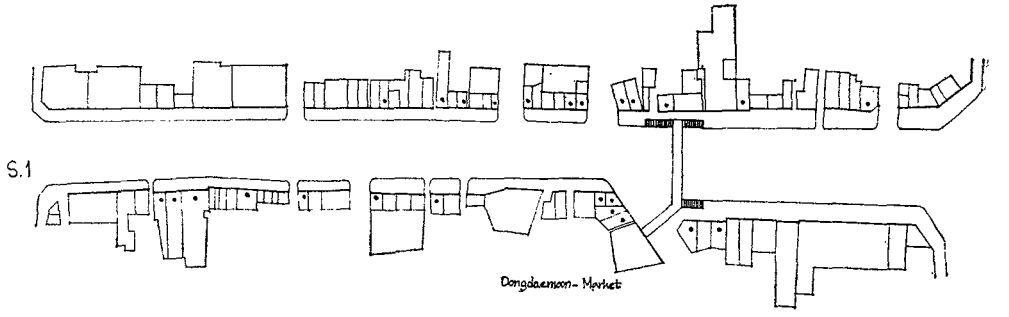


Fig. 3—4. Commercial Intensity (M.1) (S.1),

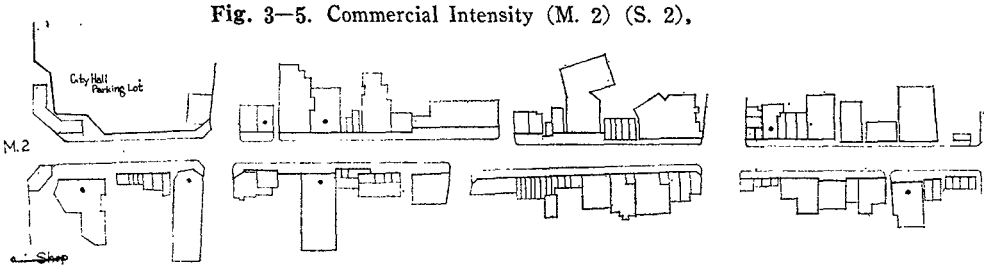


Shop : No. 20 (cf. "Land Use Coding System")

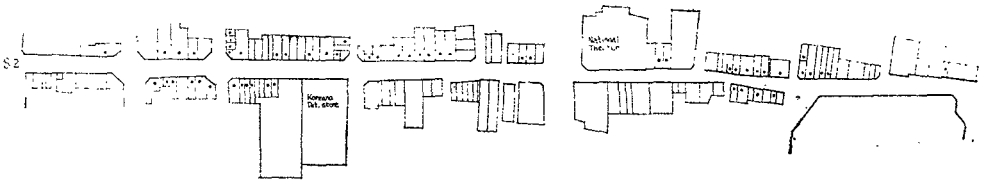


Shop : No. 17 (cf. "Land Use Coding System")

Fig. 3—5. Commercial Intensity (M. 2) (S. 2),

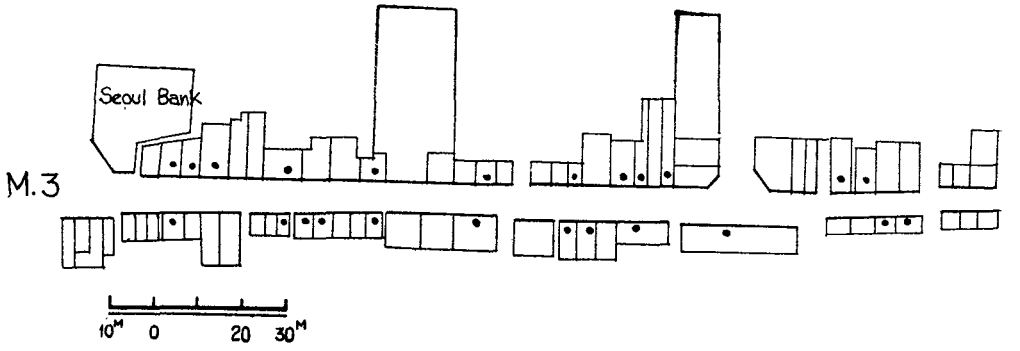


Shop : No. 41 (cf. "Land Use Coding System")

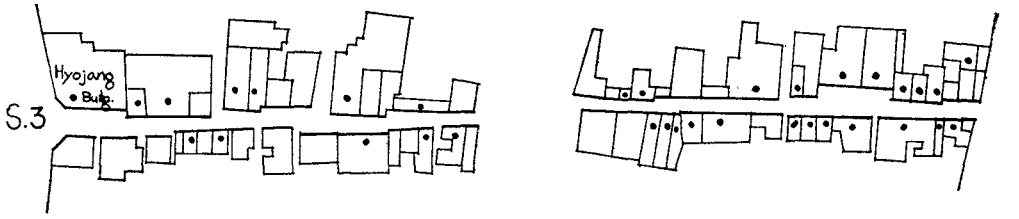


Shop : No. 20 (cf. "Land Use Coding System")

Fig. 3—6. Commercial Intensity (M.3) (S.3),



Shop : No. 12 (cf. "Land Use Coding System")



Shop : No. 11 (cf. "Land Use Coding System")

4. Analysis of Street

According to the relationship among environmental variables, units of analysis, and units of observation (cf. Fig. 3—1.), the analysis has a point of departure at the "space enclosure".

In this study, the Space Enclosure Intensity(S.E.I.) is defined;

$$S.E.I = \tan.\frac{\text{Average building height} - \text{horizontal eye sight height of pedestrian}(h)}{\text{distance between facade building and the pedestrian}}$$

$$(h) = 1.50\text{m}$$

S.E.I. are varied upon pedestrian's location on the street and the building height. (see Table 3—10.)

The fully enclosed pedestrian streets are not the broad streets but the sidewalks and the paths. In the sense of enclosure itself, the street which has full enclosure are, S.2. and S.3. This has a merit for pedestrian to feel sense of semi-public space in the street. Fully enclosure upon S.E.I. is the ratio only between street width and facade building and not indicate the optimum width of the street itself. Besides the S.E.I., the street furniture also can add to the enclosure, e.g., human scaled lights or trees.

Table 3—4. Street Enclosure Index (S.E.I.)

Street	Location of Ped.	tan(X)	Angle	S.E.I.
S. 1	a	0.94827	43°29′	
	a′	1.89655	62°12′	
	b	0.72413	35°54′	
	b′	1.44827	55°22′	
	c°	0.18985	10°45′	
	d	0.14497	8°15′	9°30′
S. 2	a	0.70238	35° 6′	
	a′	1.64285	58°40′	
	b	1.02380	45°40′	
	b′	2.11904	64°45′	40°23′
S. 3	a	1.03333	46°	
	a′	2.06666	64°11′	
	b	1.26666	51°42′	
	b′	2.53333	68°28′	49°11′
M. 1	a	1.46153	55°37′	
	a′	2.92307	71° 6′	
	b	1.69230	59°25′	
	b′	3.38461	73°33′	
	c	0.24675	13°51′	
	d	0.29350	16°21′	15°6′
M. 2	a	2.86666	70°46′	
	a′	5.73333	80° 6′	
	b	3.33333	73°18′	
	b′	6.66666	81°28′	
	c	0.59333	30°41′	
	d	0.66666	33°42′	32°37′
M. 3	a	0.17142	9°44′	
	a′	0.33333	18°26′	
	b	0.93055	42°56′	
	c	1.86111	61°45′	26°20′

5. Analysis of Activity

A. Activity Pattern

In order to analyze the activities in hierarchical order, it is necessary to provide the hierarchical classification coding system of activity.

The method of observation by following or tracing a pedestrian is basically followed in the study. As mentioned in the previous chapter, a simple phenomenon, e.g., "A man is walking", can be translated in seven units of observation which have five elements of conditions in hierarchy.

Fig. 3—7. Space Enclosure (M. 1) (S. 1),

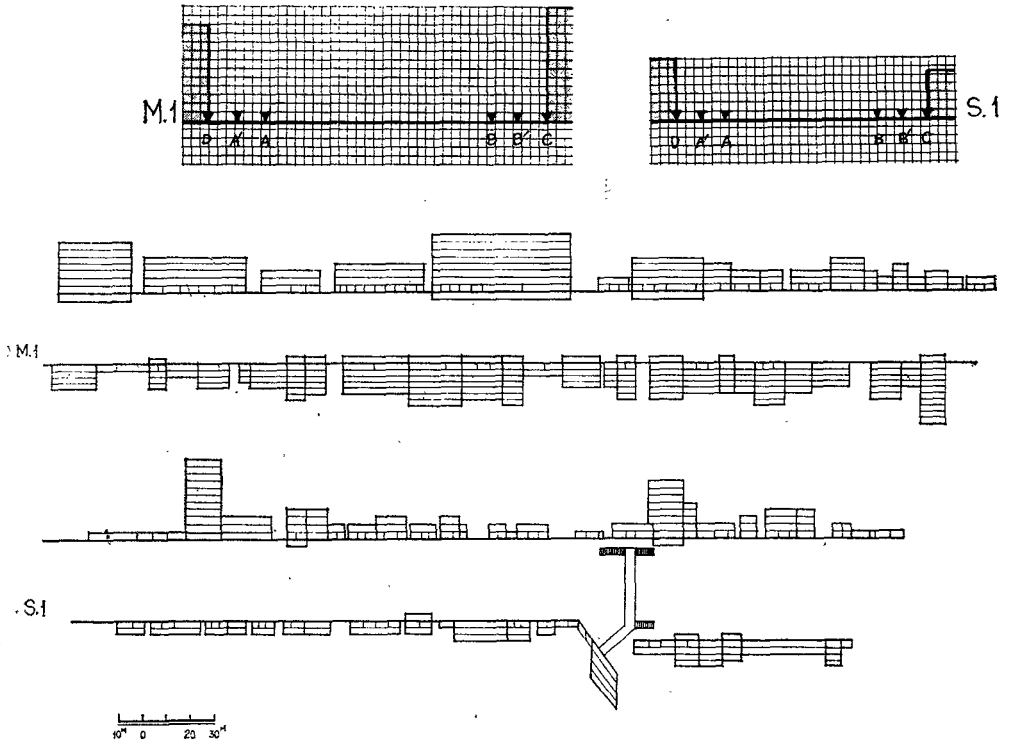


Fig. 3—8. Space Enclosure (M. 2) (S. 2),

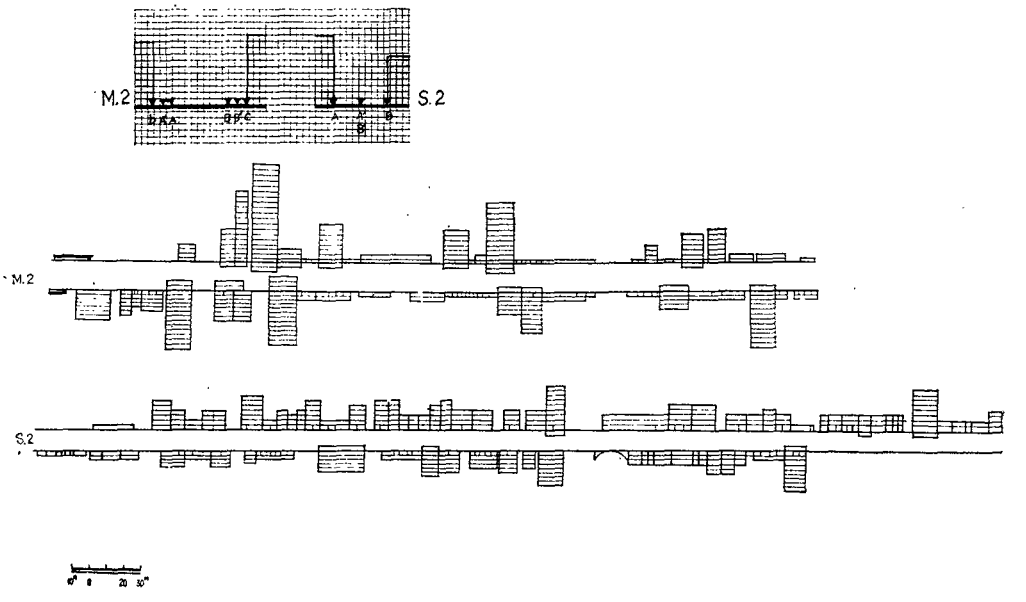


Fig. 3—9. Space Enclosure (M. 3) (S. 3).

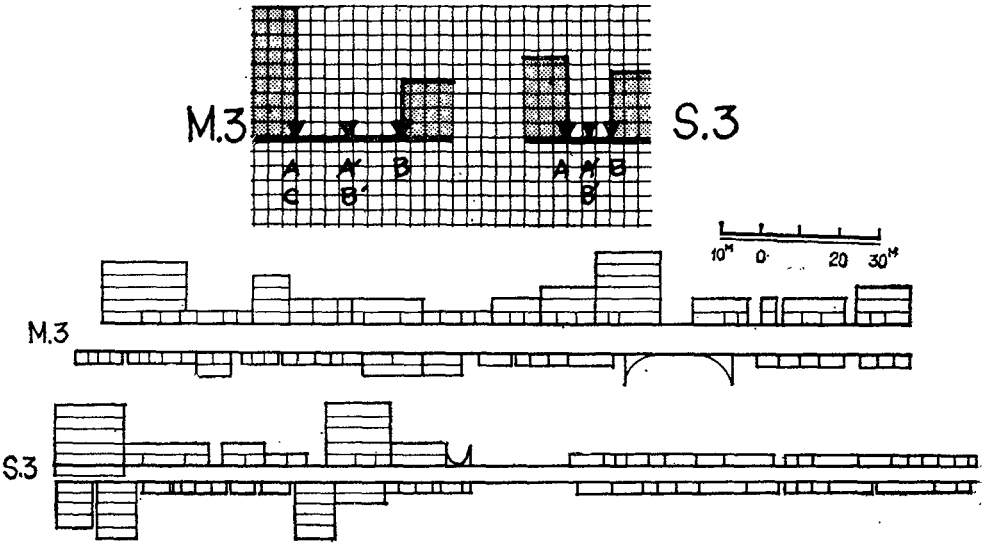
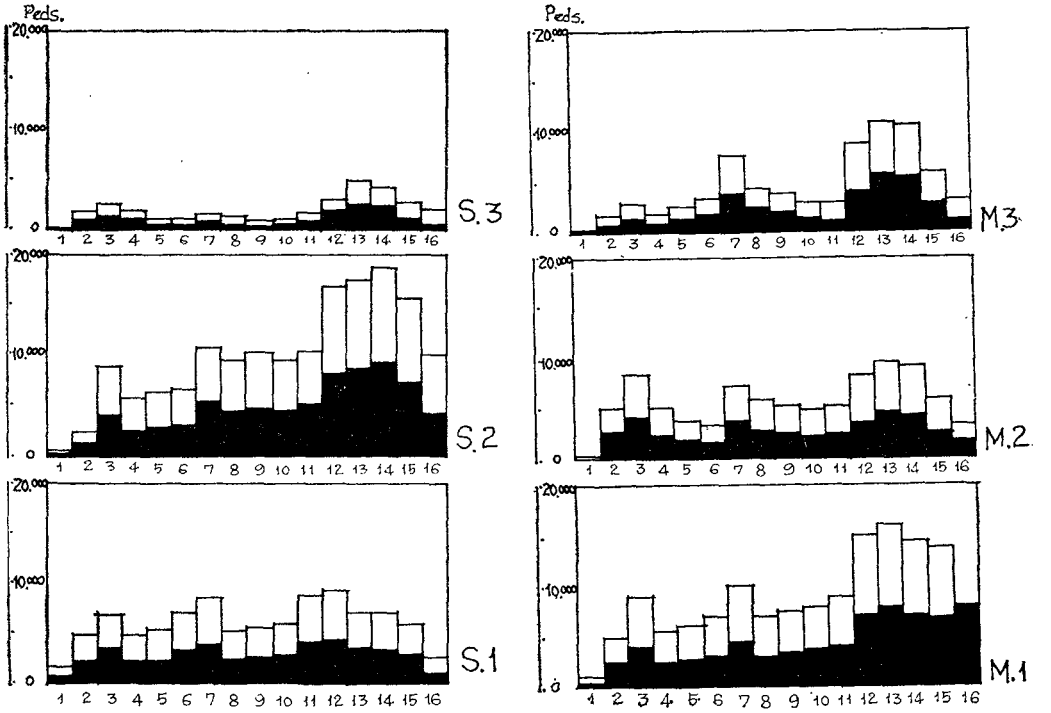


Fig. 3—10. Traffic Volume : (S. 1), (S. 2), (S. 3), (M. 1), (M. 2), (M. 3).



1. Am. 6 : 00— 7 : 00
2. 7 : 00— 8 : 00
3. 8 : 00— 9 : 00
4. 9 : 00—10 : 00
5. AM. 10 : 00—11 : 00
6. 11 : 00—12 : 00
7. 12 : 00— 1 : 00
8. P.M 1 : 00— 2 : 00
9. PM. 2 : 00—3 : 00
10. 3 : 00—4 : 00
11. 4 : 00—5 : 00
12. 5 : 00—6 : 00
13. PM. 6 : 00— 7 : 00
14. 7 : 00— 8 : 00
15. 8 : 00— 9 : 00
16. 9 : 00—10 : 00

□ orientation(A) ■ orientation(B)

Table 3—5. Classification Coding System of Pedestrian Activity

sub-systems of Activity	classification of sub-system	weighting score
A. Objective	pass	1
	visit	4
B. Group (No. of ped.)	one ped.	1
	two peds.	2
	three peds.	3
	four peds.	4
	five peds. and over	5
C. Walking speed	walk with hurried step	1
	brisk walk	2
	go at a walk(medium speed)	3
	variable speed walk	4
	slow walk	5
D. Motion	straight	1
	looking around	2
	eating or drinking	3
	eye shopping	4
	drop into booth or stall	5
E. Posture	steady	1
	hand in hand	2
	arm in arm	3
	putting arms around each other's shoulders	4
	other posture else	5
F. Trace of ped's movement	direct	1
	erratic	2
	curvilinear	3
	with diversion	4
	meandering	5
G. Incidental load	empty-handed	1
	small bag or papers	2
	books, large bag	3
	load	4
	baby carrige or baby	5

Activity Intensity Index (A.I.I.) is a term in this study as;

$$\text{A.I.I.}=\frac{\sum_{i=1}^{6}(\text{A}+\text{B}+\text{C}+\text{D}+\text{E}+\text{F}+\text{G})}{6}$$

The statistics from this observations show the changes of activity patterns on different

street and in different times.(see Table 3—6)[17]

Table 3—6. Hourly Changes of Activity Patterns of Selected Streets.

time / street	t.1 8 : 00— 9 : 00	t.2 10 : 00— 11 : 00	t.3 12 : 00— 13 : 00	t.4 17 : 00— 18 : 00	t.5 18 : 00— 19 : 00	t.6 20 : 00— 21 : 00	Total	A.I.I.
S.1	11.02	16.08	18.05	18.55	18.00	18.55	100.25	16.71
S.2	10.71	16.25	17.85	20.00	23.82	24.04	114.67	19.11
S.3	11.65	16.85	21.19	21.21	20.85	23.11	115.58	19.26
M.1	9.25	14.85	15.85	16.61	17.35	20.45	94.36	15.73
M.2	9.45	12.51	15.15	19.61	15.85	18.05	90.62	15.10
M.3	8.91	13.55	14.80	17.05	17.00	17.38	88.68	14.78

As is shown in A.I.I., the narrower the width of the street or path, the higher the intensity of activity in the "Spcialized Commercial Street"; and the wider the width of the street or path, the higher the intensity of activity in the "Mixed Commercial Street".

To understand the hourly changes of activity during a day, the "Standard Deviation of Activity" can be used.

$$\text{Standard Deviation of Activity(S.D.A)} = \sqrt{\frac{\sum_{t=1}^{6}\left\{\text{scores (t)-A.I.I. (Daily mean scores)}\right\}^2}{6}}$$

therefore,

S.1=2.69 S.2=3.96 S.3=3.78 M.1=3.39 M.2=3.38 M.3=2.96

More precise results are shown in each "Activity Fluctuation Index(A.F.I.)."

$$\text{A.F.I.} = \frac{\text{S.D.A.}}{\text{A.I.I.}}$$

$$\text{S.D.A.(S.1)} = \frac{2.69}{16.69} = 0.16117(0.161)$$

$$\text{S.D.A.(S.2)} = \frac{3.96}{19.10} = 0.20732(0.207)$$

$$\text{S.D.A.(S.3)} = \frac{3.78}{19.26} = 0.19626(0.196)$$

$$\text{S.D.A.(M.1)} = \frac{3.39}{15.69} = 0.21606(0.216)$$

$$\text{S.D.A-(M.2)} = \frac{3.38}{15.10} = 0.22384(0.224)$$

(17) To understand the patterns of hourly change of activities, the observation is carried on during six different periods: morning peak hour(Am. 8 : 00—9 : 00), morning (Am. 10 : 00—11 : 00), midday (Am. 12 : 00—Pm. 1 : 00). evening (Pm. 5 : 00—6 : 00), evening peak(Pm. 6 : 00—7 : 00), night (Pm. 8 : 00—9 : 00). The degital figures in each cell represent the mean scores of 20 pedestrians who are selected as samples.

$$S.D.A.(M.3)=\frac{2.96}{14.77}=0.20040(0.200)$$

According to above statistic results of "Activity Fluctuation Index" of six streets, "Mixed Commercial Street" has more fluctuations than "Specialized Commercial Street", while "Specialized Commercial Street" includes particular high Activity Intensity Index in general. Therefore, "Specialized Commercial Streets" have a higher intensity activity pattern, while "Mixed Commercial Streets" have diversified one. On the other hand the Activity Intensity is decreasing as the width of streets or paths increase in general.

B. Traffic Volume

Traffic volume survey was undertaken to analyze, first the relationship between sidewalk width and traffic volume and second the relationship between traffic volume and the activity pattern. In order to show the general pedestrian-traffic volume of streets, Fig. 3.10 explain them in a precise form and show how the patterns are different between "Specialized Commercial Street" and "Mixed Commercial Street", and in the right of way of each street.

6. Summary of Analysis

A. Analysis of Environment: Land Use.

According to the "Commerial Intensity Index" (C.I.I.) of the streets, narrow paths are more specialized both on "Specialized Commercial Streets" and "Mixed Commercial Streets". Especially S.3, M.3, and S.2 show that one kind of shops are perceived to be predominant along the paths.[18]

B. Analysis of Street: Enclosure of the Space

Commonly, 1 : 1 D/H Ratio makes the space be fully enclosed. The higher the buildings, the stronger the enclosure. But, too high buildings make people feel unpleasant because of their over-powering appearances. S.2 and S.3 make them perceive as semi-exterior and/or semi-public space for their full enclosure.

C. Analysis of Activity: Activity Patterns

The pedestrian activities more lively on the "Specialized Commercial Streets" than the "Mixed Commercial Streets". The A.I.I.(Activity Intensity Index) is decreasing as the width of the street decreases on the "S.C.S.", while it is increasing on the "M.C.S." as the width decreases. That is to say, that "S.C.S." have more lively activities and the "M.C.S." have more diversified activities.[19]

(18) The highest C.I.I. of each street: S.1, 21.9%; S.2, 25.52%; S.3, 58.61%; M.1, 14.91%; M.2, 20.48%; M.3, 39.62%.
(19) Standard Deviation of Activity: S.1, 2.69; S.2, 3.96; S.3, 3.78; M.1, 3.39; M.2, 3.38; M.3, 2.96.

IV. Conclusion

1. Model Formulation

In order to test the hypothesis that if the environment varies, the functions of a particular pedestrian street change, the general studies about street and activity was attempted as in chapter II and the analysis of the environment of street, and of the activities on it were carried out in reference to three environmental variables as in chapter III.

Through above process, it was to formulate a model of functions of street as affected by the pedestrian activities. The formulation process is similar to a search process of the "L.C.M."(lowest common multiple) in "factorization" for the adaptable model which is formulated for the environment-comforming street design based on the pedestrian activities. Thus, it is now to find the relationship among three; typology of environment, typology of activity and typology of function.

A. Typology of environment: land use as a street environment(C.I.I.) and enclosure as physical condition(E.I.I.)

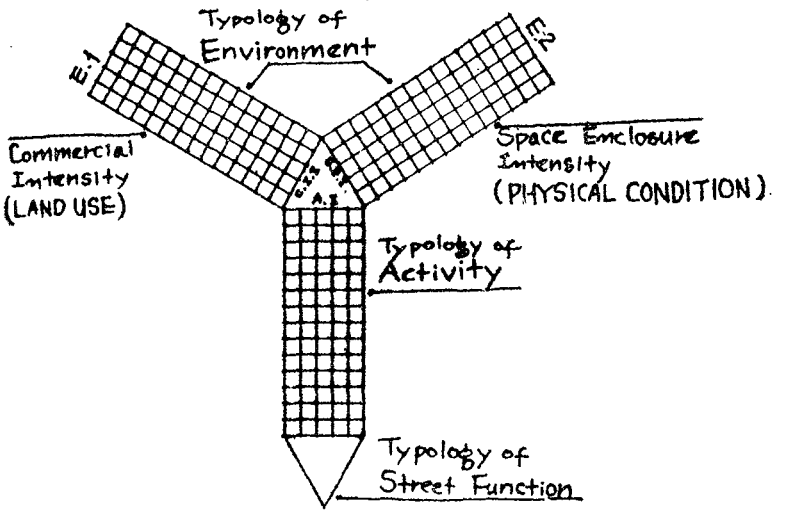
B. Typology of activity(A.I.I.)

C. Typology of street function

$B=f(A)$

$C=f(B)$

Fig. 4—1. Conceptual Diagram of Modelling Street Functions.



To test above relationships, first it is necessary to relate A(typology of environment) to B(typology of Activity), second to derive C(typology of street function) between two and other elements affecting the street function, and finally to define the relationships among three (A, B and C) to formulate the models of street function.(see Fig. 4—1.)

2. Typology of Street Functions

Table 4.1 illustrates the functions of street the relationship among the typology of activity, the typology of environment, and the street functions in hourly change.

a. Flow Channel

Street is used for traffic flow only on "Mixed Commercial Streets" at the morning peak hour.

b. Pass Channel

Street is used for passage-way(no more strongly than the flow channel) on both "S.C.S" and "M.C.S." in the morning and at the morning peak hour.

c. Terrace

Street is used for a space for converging movement for resting, where movable street-furnitures or stalls are arranged in the morning and midday.

d. Gallery

Street is used for a space for active visiting movement such as strolling, window-shopping, and dropping into shops and stalls. Street and its environment are functionally integrated.

e. Arcade

Street is used as a space for active enjoying activities and used for living-space of the city when the vehicles are not admitted.

f. Booth

Street is used for a space similar to plazas or hollows of recreational site. Street is perceived as an extended interior space and functions as the pedestrian space.[20]

Above functions of street are rearranged in analogue models as shown in Fig. 4.2. These models are represented by the following elements: (a) Street functions based on activities; (b) Space occupation; and (c) Interaction between street and environment. The applications of the analogue model to the streets selected for the present survey in terms of hourly change of activity patterns are shown in Fig. 4.3.

(20) The terms (Flow Channel, Pass Channel, Terrace, Gallery, Arcade, Booth) are used conceptually.

Table 4—1. Typology of Street Functions

Activity Intensity Index (A.I.I.)	Typology of Activity	Typology of Street Function		Typology of Environment	Time
7 8	Swift movement in volume (Direct)	(a) Flow channel	traffic	Mixed Commercial Street	t.1
9 10 11 12 13	Movement in volume (Passing)	(b) Pass channel	traffic	Mixed Commercial Street Specialized Commercial Street	t.1, t.2 t.6
14 15 16 17 18	Merging of movement (Curvilinear)	(c) Terrace	transi-tional	Specialized Commercial Street Mixed Commercial Street	t.3, t.2 t.5
19 20	Active visiting movement (Diversion)	(d) Gallery	transi-tional	S.C.S. M.C.S.	t.4, t.3
21 22 23 24 25 26 27	Active enjoying movement (Meandering)	(e) Arcade	transi-tional	Specialized Commercial Street	t.4, t.5, t.6
28 29 30 31 32 33 34	Occupation (Stagnation)	(f) Booth	non-traffic	Specialized Commercial Street	t.5, t.6

Fig. 4—2. Analogue Models of Street Functions.

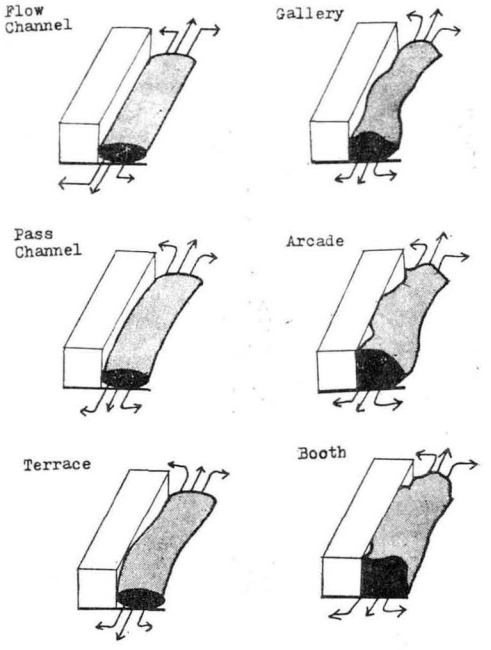
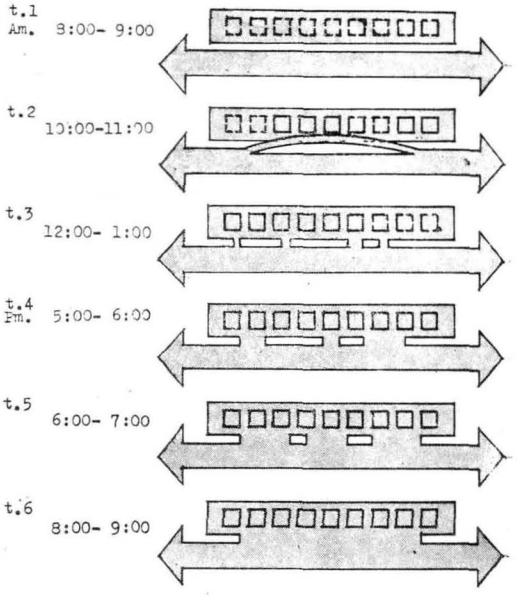


Fig. 4—3. Application of Models to Present Street in Hourly Change.



3. Derivation of Design Criteria

A. Space Characteristics

According to the results of the previous section, street space is divided in its functional characteristics as, "flow channel", "pass channel", "terrace", "gallery", "arcade", and "booth." In this section, design criteria are derived from above analysis with respect to the space characteristics and space requirements.

Fig. 4—4. explains the space characterisitcs in terms of the functions of streets. Space enclosure was dealt with in Chap. III. According to the changes of street functions, more fuller enclosure is also required. These enclosures make the street be used as semi-public spaces to be visited.

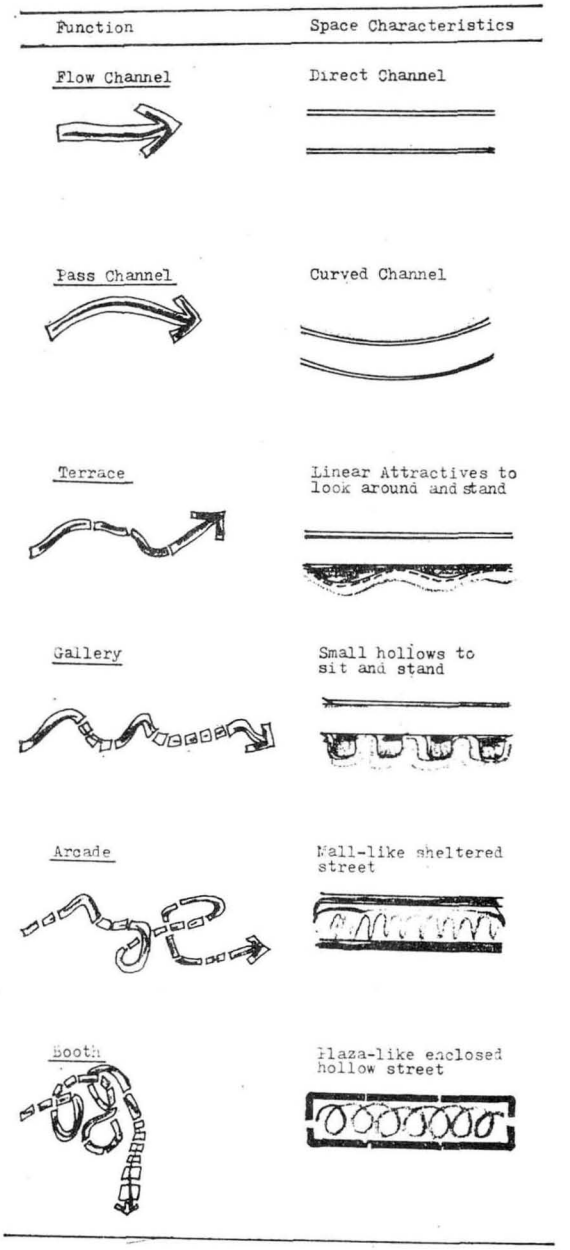
B. Space Requirements

B-1. Standing Space Requirement

Average-size human bodies in a vertical position, pressed together with virtually no room for movement, can occupy as little as 1.0 square feet per woman and 1.5 square feet per man. Psychologists have found that a man standing requires about 2.4 to 2.8 square feet per person to avoid touching each other and prefer a "body buffer zone" of

4 to 9 square feet to avoid emotional discomfort in the presence of strangers.[21] Emotional considerations aside, there are some practical ones as if under a covered area of umbrella. In establisning the dimensions of outdoor spaces for pedestrians, considerations

Fig. 4—4. Space Characteristics



(21) cf. John J. Fruin, *op. cit.*, pp. 20—24.

of this type can be of importance, if we do not want circulation to break down when it rains.

A classificaion of interpersonal distances was suggestted by the anthropologist, Edward T. Hall(see Table 4—2.). There are many situations in which the space available around standing pedestrians includes queueing areas. In a recent study of pedestrian design standards, John J. Fruin described the characteristics of six levels of pedestrian density in the stationary situation. (see Fig. 4—3.)

Table 4—2. Interpersonal Distances

	Distance, Face-to-Face, in Feet	Area Required Per Person
INTIMATE	less than 1.5	less than 3 sq. ft.
PERSONAL	1.5 to 4	3 to 13 sq. ft.
SOCIAL	4 to 12	13 to 110 sq. ft.
PUBLIC	12 or more	110 or more sq. ft.

source : Edward T. Hall, *The Hidden Dimension*, New York, Doubleday, 1966, pp. 107—122.

Table 4—3. Levels of Service for Standing Pedestrians

Quality	Spacing, Feet	Area Per Person, Sq. Ft.	Description
UNIMPEDED	over 4	over 13	Circulation between standing pedestrians is possible without disturbing them.
IMPEDED	3.5 to 4	10 to 13	Circulation between standing pedestrians is somewhat restricted.
	3 to 3.5	7 to 10	Comfortable for standing without being affected by others, but walking between standees possible only by disturbing them ("excuse me").
CONSTRAINED	2 to 3	3 to 7	Standing pedestrians do not touch each other, but are uncomfortably close together, circulation through the group is severely restricted, and forward movement is only possible as a group.
CONGESTED	under 2	2 to 3	Contact with others is unavoidable, circulation through the group is impossible.
JAMMED	0	under 2	Standees are pressed together, no movement is possible.

source : John J. Fruin, *Pedestrian Planning and Design*, New York, Metropolitan Association of Urban Designers and Environmental Planners, Inc., 1971, pp. 24—37.

B-2. Walking Space Requirements

Human locomotion, quite naturally, requires more room than standing to allow for the physical act of pacing and also for a buffer zone large enough to anticipate potential collisions and to take evasive act.

The traditional equation describing traffc flow is: Flow=Speed X Density. In a more accurate study, Pushkarev & Zupan rewrite the equation as follows:

$$\text{space}\frac{\text{ft}^2}{(\text{ped})} = \frac{\text{speed(ft/min)}}{\text{flow(peds/min/ft)}} \quad (22)$$

They look at the relationship between speed and flow. It is represented by a parabolic curve, similar to the motor vehicle flow analysis. When speed is zero, flow is zero. As speed increase, flow increases. At a certain speed, flow reaches its maximum point, and then starts to decline with increasing speed. At very high speeds, flow is very small because each participant in a traffic stream requires more room to avoid hitting others, whereas at lower speeds closer spacing is possible.

A summary of the different kinds of possible pedestrian behaviours at different densities is presented in Table 4.4.

4. Concluding Remarks

We have thus far attemped to show that the street is not only a flow channel but also

Table 4—4. Levels of Pedestrian Density in Movement

Average Area Per Person, sq. ft.	Characteristics
2 to 5	Flow: erratic, on the verge of complete stoppage Choice of speed: none, movement only with the crowd Crossing or reverse movement: impossible Conflicts: physical contact unavoidable Passing: impossible
5 to 7	Flow: attains a maximum in traffic streams under pressure Average speed: mostly shuffling Choice of speed: none, movement only with the crowd Crossing or reverse movement: most difficult Conflicts: physical contact probable, conflicts unavoidable Passing: impossible

(22) Boris S. Pushkarev & Jeffrey M. Zupan, *Space for Pedestrian*, New York, Regional Planning Association, 1970, p. 53.

7 to 11	Flow: attains a maximum in more relaxed traffic streams Average speed: about two-thirds of that at free flow Choice of speed: practically none Crossing or reverse movemet: severely restricted, with conflicts and collisions Conflicts: physical contact probable, conflicts unavoidable Passing: impossible
11 ot 15	Flow: 65 to 80 percent of maximum capacity Average speed: about three-quarters of that at free flow Choice of speed: restricted, constant adjustments of gait necessary Crossing or reverse movement: severely restricted, with conflicts Conflicts: unavoidable Passing: rarely possible without touching
15 to 18	Flow: 56 to 70 percent of maximum capacity Average speed: about four-fifths of that at free flow Choice of speed: restricted except for slow walkers Crossing or reverse movement: restricted, with conflicts Conflicts: probabillity high Passing: rarely possible without touching
18 to 25	Flow: roughly half of maximum capacity Average speed: about four-fifths of that at free flow Choice of speed: unless stream homogenous, restricted by bunching Crossing or reverse movement: possible, with conflicts Conflicts: probability high Passing: difficult without abrupt maneuvers
25 to 36 or 40	Flow: roughly one-third of maximum capacity Average speed: approaching free flow Choice of speed: occasionally impeded Crossing or reverse movement: possible, with occasional conflicts. Conflicts: about 50 percent probability Passing: possible, but with interference
over 36 or 40	Flow: one-fifth of maximum capacity or less Average speed: virtually as chosen Choice of speed: virtually unrestricted Crossing or reverse movement: free Conflicts: maneuvering needed to avoid conflicts Passing: free, with some maneuvering

source : Boris S. Pushkarev & Jeffrey M. Zupan, *Space for Pedestrians*, New York, Regional Planning Association, 1970, pp. 61—62.

as a visiting space, especially in the commercial or shopping street in CBD.

People like to walk every where. In the cities people are attracted by shops, tree lined streets, historical sites, and many other people. They want to walk in convenience, health, and pleasure.

First of all, we can make the sidewalks more pleasant by better caring the trees. Another way to improve existing pedestrian conditions is to use lighting fixtures designed in a human scale. The huge standards which illuminate broad aroad may be satisfactory for highways, but they impart no sense of serenity or security to the man on foot. The appearance and character of sidewalks can be improved with well-designed street furniture, graphics or exhibition booths with street names, traffic signals, signs, informations, waste-baskets, mail boxes, fire alarms, telephone-booths, seats, plants, fountains, and sculptures. More positive suggestions can include building more pedestrian malls, arcades, traffic-free walks, and pedestrian precinct.

Most sidewalks in the CBD of Seoul are too narrow for the safety and comfort of the pedestrians. For example,(Chongro-5-ga) street measures over 35metrs from the building line to the opposite side and yet, it is one of the widest streets. But its sidewalks are now only about 5.5 meters wide in spite of the fact that various market-related activities are there. Thus, the thing we can do is to give a few more meters for the sidewalks.

It is hoped that this study can contribute to humanizing the pedestrian streets. However, the observation in this study of the activities on the selected street, was limited to a few days in a year and also for relatively short periods of time of a day. Therefore, the conclusions drawn from this study on the functions of street may not validly be generalizable beyond the scope of survey undertaken here. Nonetheless, it is expected that this is a beginning of similar studies that could indentify the relationship between the street functions and the environment thereof in a broader context.

BIBLIOGRAPHY

Books

Abler, Ronakd, Abams John S., Gould, Peter, *Spatial Organization*, "The Geographer's View of the World", Englewood cliffs, New Jersey, Prentice-Hall, Inc., 1971.

Annett, John, *Feedback and Human Behaviour*, Baltimore, Penguin Books Inc., 1972.

Ashihara, Yoshinobu, *Exterior Design in Architecture*, New York, Van Nostrand Reinhold Co. 1970.

Banz, George, *Elements of Urban Form*, New York, McGraw Hill Book Co., 1970.

Bernard Rudofsky, *Street for People*, Garden City, New York, Doubleday & Co., Inc., 1969.

Blunden, W.R. *The Land-Use/Transport System*, Oxford, Pergamon Press. 1973.

Buchanan, Colin, "The Specially Shortend Edition of the Buchanan Report" *Traffic in Towns*, Harmondsworth, England, Penguin Books Ltd., 1974.

Chapin, Stuart F. Jr., *Urban Land Use Planning*, 2nd ed., Urbana, Univ. of Illinois Press, 1965.

John, J. Fruin *Pedestrian Planning and Design*, New York, Metropolitan Association of Urban Designers and Environmental Planners, Inc., 1971.

Gibbs Jack P., *Urban Research Methods*, New York, Van Nostrand Co., Inc., 1961.

William I. Goodman ed., *Principles and Practice of Urban Planning*, Washington DC., International City Managers' Association, 1968.

Gutman Robert, *People and Buildings*, New York, Basic Books Inc., 1972.

Hall Edward T., *The Hidden Dimension*, New York, Doubleday, 1966.

Halprin Lawrence, *Cities*, Cambridge, M.I.T. Press, 1973.

Kang Oh Jeon, *Tonggyehak*(Statistics) Seoul, Bak-Yeong-sa, 1973.

Lynch, Kevin *Site Planning*, 2nd ed., Cambridge, Mass., M.I.T. Press, 1972.

Lynch, Kevin, *The Image of the City*, Cambridge, Mass., M.I.T. Press, 1967.

Marlin, Leslie & March, Lionel ed., "Cambridge, Urban & Architectural Sudies" *Urban Space and Structure*, Cambridge, Cambridge Univ. Press, 1972.

Meier, Richard L., *A Communication Theory of Urban Growth*, Cambridge, M.I.T. Press, 1970.

Moore, Gary T., ed., *Emerging Methods in Environmentl Design and Planning*, Cambridge, M.I.T. Press, 1970.

North Symour, Whitney, Jr., ed., *Small Urban Spaces*, New York, An Official Publication of the Parks Association, 1960.

Redstone, Louis G., *New Dimensions in Shopping Centers and Stores*, New York, McGraw Hill Book Co., 1973.

Ritter, Paul, *Planning for Man and Motor*, London, Pergamon Press, 1964.

Rudofsky, Bernald, *Streets for People*, New York, Doubleday & Co., Inc., 1969.

Sommer, Robert, *The Behavioral Basis of Design: Personal Space*, London, Prentice-Hall, Inc., 1969.

Spreiregen, Paul D. ed. *On the Art of Designing Cities*, Cambridge, M.I.T. Press, 1968.

Spreiregen, Paul D., *Urban Design: The Architecture of Towns and Cities*, New York, McGraw-Hill Book Co., 1965.

Telow, John & Goss, Anthony, *Homes, Towns and Traffic*, London, Western Printing Services, 1968.

Tyrwhitt, J., Sert. J.L., Rogers, E.N., ed., *The Heart of the City*, London, Lund Humphries & Co. Ltd., 1952.

Wingo, Lowdon Jr., *Cities and Space*, Baltimore, Johns Hopkins Press, 1966.

Wolf von Eckardt, *A Place to live*, New York, A Seymour Lawrence Book Delacorte Press, 1967.

Zucker, Paul, *Town and Square*, Cambridge, M.I.T. Press, 1973.

Articles

Appeyard, Donald & Lintell, Mark, "The Environmental Quality of City Streets: The Residents' Viewpoint" *Journal of the American Institute of Planners*, Vol 38, No 2, March. 1972.

Kim, Chang Seok, *A Study on the Structural Metamorphosis of the CBD of Seoul*, Master's Thesis of City Palnning, Graduate School of Environmental Studies, Seoul National University, 1973.

參 考 資 料

서울大學校 環境大學院 碩士學位 論文 目錄(1976年度)

1. 都市計劃學 碩士學位論文

高 秉 浩， PPBS適用을 爲한 都市豫算制度의 改善에 關한 硏究

金 裕 逸， 國立公園 集團施設地區의 規制에 關한 硏究

辛 丁 哲， 서울市 아파트地域의 成長「패턴」에 關한 硏究