AUDIOVISUAL MEDIA IN ARCHITECTURAL PRACTICE

By

P. GÁBORJÁNI

Department of Drawing and Composition, Technical University, Budapest
Received: March 26, 1979

Presented by Prof. István BALOGH

When in 1972 the idea of establishing a multilateral audio-visual (AV) studio to be utilized in architectural practice emerged, bases of a new type primary and secondary educational system were already laid overseas (mainly in Australia and in some States). This is by all means a system because the philosophical maturing of the idea and the given social and technical standards involved the new methodology. It developed through interaction of cogitation and phenomenological momentums, anticipating relation systems between man and technology as well as man to man.

In the mentioned school system these ideas are well reflected, resulting, besides our linear school system, in the *central* school type (Fig. 1). From the earlier *classroom system* to the *box system* it was as long a way as from the "Art of Benevolent Dialogues" by *Socrates* to the "Method of Dialectic Teaching" by *Galanter*.[1]

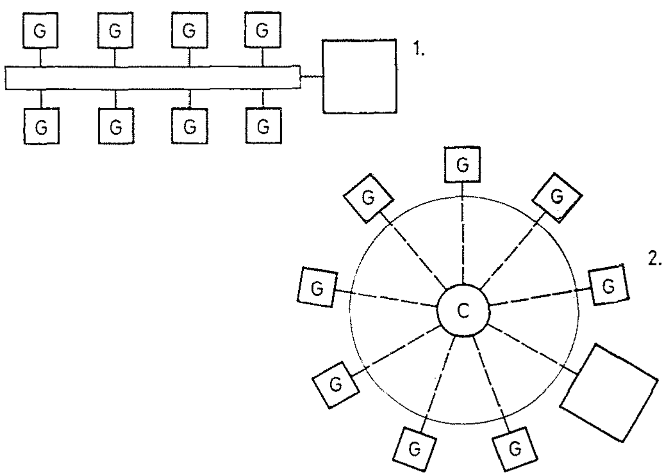

Fig. 1. 1. Scheme of the linear school type. 2. Scheme of the central school type. G = unit group; C = communication centre

[1] University of Philadelphia.

In this methodology, conscious emphasis was laid on the development of independent thinking, on the stimulation of creative activity, on the creative methodical formulation of learning and investigating. The method involved analogous problems and endeavours to consciously innervate[2] mechanizable activities. Herewith the solution of the problem got a new aspect and granted important means the systematic cogitation culture.

Essentials of the "central" school system are the following:

The working units are not aligned along passages but around a communication centre. Furthermore the group units are not separated from each other, isolated in the sphere of a teacher, but form an integer part of a greater spiritual community. The new system permits a constant comparison, an optional selection and evocation of the existing data set. A relevant element of the methodology is the assertion of the multiplying effect both in evocating the objective elements and in forming the personality. Rather than particulars of the system, some objective and formal characteristics will be outlined. The objective conditions imply some principial, philosophical determinations as well, of importance for the attitude of experts in education, psychology and numerous other research domains.

The Communication Centre may contain within wide boundaries:

1. All demonstration and information media[3] of the given institute in a wide field of reproduction.[4]

2. Different kinds of information carriers, to be chosen at will, to contain anything from the *video* system to the *diorama* and the *display* systems depending on the technical instrumentation standard.

3. Working groups can be interconnected at any time, visually or auditively.

4. A special, new methodology can be recorded at any time and transmitted from the information centre I. C. (feedback). In this way e. g. own experiments can be recalled, evaluated and re-used.

5. The I. C. allows transmission of a *general* program simultaneously for all the groups.

6. The I. C. may be connected to the corresponding information carrier of the national broadcast.

7. It offers data and information storage.

8. In recording and producing experiments with a definite purpose, and the demonstrative material, not only the informant (teacher, text-book etc.)

[2] Innervation is a readiness to react to certain types of stimuli in a definite manner. A given person is solving similar problems according to a certain pattern, thus in face of similar problems he or she uses mechanically the adequate rule.

[3] Both hardware and software.

[4] American research institutes are developing "TV-desks" as proper means of individual learning. These would assume the functions of the traditional blackboard, copybook and book, but could also be branched through any number of inputs and outputs to central information systems, to a national network, to libraries etc.

but also the receiver (experimenter, student) are taking part, not only as "passive" receivers but as active co-operators.

In institutes adopting the new method, preliminary consultations were held with the architects designing the schools, discussing how to follow a new philosophy by materially shaping the institute so as to cope with the automated study mechanism. Although the debates are still continuing, the architects felt assertion of the human scale and technical standard to be substantial. Schools have been built by the dozens in the USA and in Australia, reflecting the ideal guiding principle of the new school type. Also European pedagogues and architects are expected to face these new viewpoints in coming decades.[5]

Programmed teaching is expected to extend over all educational forms at an exponential rate.[6]

Stating the problem of AV-media

Research work on the use and extension of audiovisual media started in 1972 at the Department of Drawing and Composition, Technical University, Budapest. Experience in visual education showed imminent revolutionary changes in the quality of general social spheres and in visual education. This is partly due to technical-civilizational changes, and partly to cultural redifferentiation, namely the "literature-centered" approach slowly yields to a more up-to-date, integrated approach where psychological and philosophical knowledge may also affect education. The rather fast development of architectural psychology, technical psychology and synesthesy is by no means accidental.

Use of the communication language

In the report "Visual Studio" published at the Technical University, Budapest, the relevant philosophical and psychological questions have been treated,[7] with little concern of the *language,* without it, however, establishment of thinking and development models of audio-visual technologies is hardly imaginable. Conservative followers of the traditional school do not endeavour to know and adopt the new language. Certainly this is not some meta-language — such as the computer languages — but a slowly developing international verbal means of expression.[8] Verbal transposition of our entire visual world

[5] Extension of "standardized learning forms" does not meet objective difficulties but subjective causes of approach. Comments on the *Snow* polemy see in [1].

[6] In the 17th century, *J. A. Comenius* mentions the idea of "autopraxis" in Didactica Magna.

[7] Perception processes and essentials of the method. Visual transformation domains peculiar to audio-visual media, primarily, items of use in architectural education and practice.

[8] E. M. Fehér (Canada) in [8] urges to create a universal language, besides of stressing the superiority of the English language for its simple syntax and rich vocabulary.

concept is at a very low level, although this would be the base of verbal communication in audio-visual systems.

The language is of importance here not only for granting exactitude and unambiguity of expression but first of all *for its reaction on thinking*.

The imperative of revaluating the visual culture

Visualization (visual perception) has grown in importance among others because on the present civilization level our visual impressions do not arise simply by directly looking at nature. "Extension of technical spheres concerns the visual perception; frequency and rate of impressions, changes of technical manipulation caused a new approach to emerge." [9]

Perception fields underwent qualitative and quantitative changes:

A. Partly, the visual sources affecting man have multiplied,[9] and partly, various jobs require a higher perception level. Impacts from a wide range of technical equipment must be perceived, and this rapidly, selectively, at the same time co-ordinating the processes of consciousness (Fig. 2).

B. The other reason of changes is the development of synthesizing vision n perception systems [10].

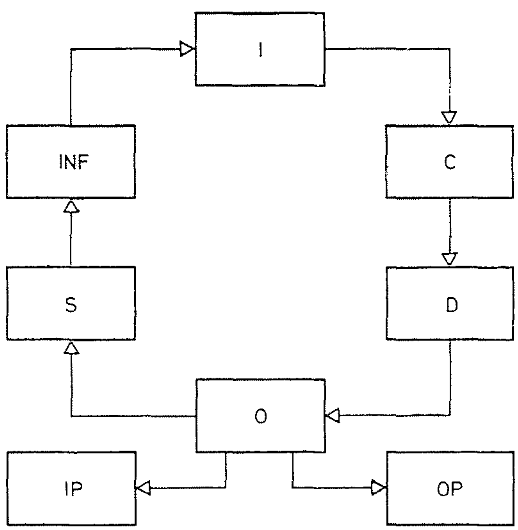

Fig. 2. I = information processing by the brain. INF = information intake, perception by telereceptors; S = instrument signals; O = controlled object (instrument, computer etc.); C = control (human); D = directing organs of technical equipment; IP = system input; OP = system output

[9] According to an earlier international survey by UNESCO, visual receptors absorb 38% of impression stimuli and transfer them to the human brain.

Even specialists are puzzled by the level in the nervous system and functional forms of physico-chemical changes of stimulation by stimuli; this fact may be responsible for the uncertainty in this problem. Nevertheless some results have been achieved in synesthesia research [11]. The different sensory systems interact as facilities of information of the real, sensible world as a condition of life. Information concomitant to sight (simultaneous, previous or ulterior) complete, suppress or reinforce each other. This was also taken into account in our experiments, as a possibility of compensated suppression of some unwanted element. Anyhow, in given situations (such as in architectural practice) other, relevant elements completing the visual perception have to be taken into account.

"Studio" program and preliminary tests

The program of the "Multi-purpose Visual Studio" has been launched at the Technical University, Budapest in the early seventies.

Antecedents

To develop the studio, first the two models of visual perception have been established.

A — In "one viewpoint" contemplation, man is in the middle and elements of the material world move around him, thus the dynamic element surrounds the static element.

B — In the other way of contemplation, the space or mass or another element is in the middle and man in motion perceives the environment *(contemplation by sight during motion)*.

To form a spatial process is an architectural task. Test data are provided by the laboratory by simulating space details and thus pointing out and recording advantages and disadvantages of separate elementary space forms. It can be shown how the activity of man moving in space may be influenced under given space conditions by different surfacings [12], colour and light effects; how to choose the depth or height of the room, the distance covered during unit time, etc.

E. M. Fehér of Canada, referred to above, developed the program of the OCA light laboratory, set up early in the seventies in the College of Art in Ontario [13] with an overall floor area of 83 m^2. In addition to traditional items such as

— stage,
— building,
— space effects,
— light and colour effects etc.,

the laboratory includes the following units:

Wall surface I:

a) projector,
b) two light fields (working fields of two slides),
c) two modelling surfaces illuminated from below,
d) a mobile projector with curvilinear screens.

Wall surface II:

a) projector,
b) operating table for the technician,
c) platform,
d) "demonstration" wall surface 575 by 760 mm with 12 light boxes,
e) air compressor directed to the light field,
f) light control equipment.

Wall surface III:

a) projector,
b) light field,
c) modelling surface illuminated from below,
d) curvilinear, colourable testing surface,
e) "demonstration" surface with different light sources,
f) electric circuit.

Wall surface IV:

a) projector,
b) platform with loading area,
c) thyristorized fluorescent lamp control for a lighting program,
d) programming desk (7-channel electric distribution storage),
e) demonstration equipment for special display of various light sources,
f) switchboard with amplifier.

The program also described the electric distribution system, the projection wall system and the electro-acoustic equipment.

Realization of our *Studio* program would not only forward experimental goals but also intensify the educational work. To this aim, also individual working places would be needed [13].

Fundamentals of audio-visual methods of visual education

(Part of the Studio program)

a) The object to be represented can be visualized in the necessary variations — hence, from different visual directions, under different conditions of illumination intensity, colour and direction. The scale of the adjusted mass or space model can be changed at will so that during this change the onlooker gets acquainted with the entire object. A complete picture is offered of dimensions, spatial position and projectional presentation of the construction, skeleton, sculpture or mass form.

b) There is no more categoric division between model and observer. Special projection can cause the model and its sphere of influence to fill simultaneously the entire space. Mobile partition walls are available to adjust for oneself the spatial position, simultaneously co-ordinating the light and sound effects.

c) In the laboratory the co-operation of model and observer can be imaged both on slide and on film, and "re-projected" by means of a display equipment, providing permanent check-up for the observer. The perception process can be completed by auditive elements, thus influencing significant momentums of the imaged phenomenon.

Descriptive geometry methods can empirically display spatial systems with a direct transposition to two dimensions, offering, in turn, new ways of teaching descriptive geometry so that aspect and delineation do not bifurcate but remain a unity, the projections of the model can be directly plotted either manually or mechanically in a reference system (e. g. between limits of the image planes).

Visualization by simulation may be facilitated by endoscopic projection. For a time, equipment with glass fibre optics has been used in medical practice for testing internal organs. On the Author's request, a British instruments factory has developed an adapted form of a colorimeter (Lovibond) for projecting true-to-size minor interior spaces. Costs of this equipment have, however, been prohibitive.

Recently, the equipment for endoscopic transposition [14] has been used at the Institute of Town Planning, University of Stuttgart, for experiments in town planning adaptations, etc.

Aspects of developing the Multi-Purpose Visual Studio

a) *Layout* (Fig. 3)
b) *Methodology*
c) *Instrumentation.*

ad a) The *layout* strives toward *flexibility*. Partition walls (modular units) necessary for space simulation can be attached by magnetic means to a stretched steel net, to be easy to change. The control unit contains the instruments for servicing the space.

The projection room is such as to permit dioramatic or kineramatic projection, with a microphone connection to the sound insulated control unit.

Light field zones suit multilateral light demonstrations, or simulation by light effects.

ad b) Architectural space *modelling* is an effective exercise in design ranging from the demonstration of optical phenomena[10] to the research of elements of the built environment. Anything can be demonstrated, from the

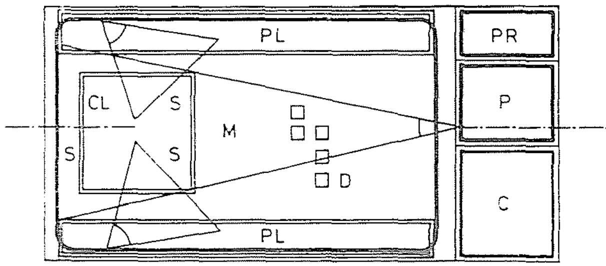

Fig. 3. C = control unit; P = projection room; PR = preparation cubicle; M = manipulation room; CL = central light field; PL = partial light field; S = screen; D = mobile modelling-testing desks

Ames phenomenon to the theorem by L. S. and R. PENROSE on object hypothesis. (Quite a number of sensory and optical delusions can be perceptibly demonstrated, such as the *Müller—Lyer* occurrence phenomenon.) Visual turn over as biological phenomenon of retina emulation could give directions for development of a modular system of the concrete architectural space (repetitive space walls, arcades, etc.). Greek architects were acquainted enough with these phenomena and used them consciously in construction (for instance, placing inner columns closer to each other rather than with uniform intercolumnia made them look like even spaced).

The methods to be developed aim at the conscious recognition of psychological and psychophysiological elements, not only as perception of the phenomena, but also as development of test methods in behaviorism (introspection, habituation, behaviour development, special examination of the Skinner phenomenon). The goal is to widen the range of conscious reinforcing mechanisms (operative conditioning), to realize conditions of connection between "behaviour of subjects and its consequences" [16].

Another important methodology factor has to be mentioned. In tests (e. g. preference tests) generally no representative surveys are made. Repeated samplings were seen from test reproducibility to be completely satisfactory. Heuristics often offered a wider range of exploration (e. g. interaction between relief and colour, or sound and colour, and their psychological effect).

Another aspect of this problem is the method of observation. The present scientific research methods are generally considered that "confrontation of a

[10] J. GIBSON enumerates thirteen varieties of perspectives based on position perspective, parallactic perspective, and perspectives independent of position and motion of the observer.

high number of observation data permits to state certain defined relations, and by making them agree, more general, subsequently ever more comprehensive regularities may be discovered step by step." [17] "This picture is false. In reality, relatively few data are extrapolated to rather far-reaching relationships and hypotheses, and these are checked afterwards on new data, often discarded and replaced by new hypotheses.

Scientific discoveries do not arise from the linking of data, conform to logical steps, but from hypotheses more or less supported by bold analogies. These can be either sustained by data looked up to justify them or have to be modified or discarded. This path is more hesitating, throbbing and devious than that of logic."

Accordingly, induction is a method easier to follow than is deduction, and this applies to a *transfer generalization* test as well as to any kind of conditioning (S-R formula, etc.).

ad c) *Instrumentation* of the Audio-Visual Studio does not suppose a steady condition. These being procedure systems, the problem is to produce a multi-way connection between units at any point of the system in either direction.

Accordingly, this is an open system where *modular blocks* may be removed or inserted, as *punctum saliens* of the equipment construction.

Description of the equipment

1. An "elastic" screen, mobile partition wall system, to produce real and sham perspective effects. "Walls" are transparent but provided with exchangeable texture and colour.

2. Variable elements suspended in space are fundamental forms of a mock furniture,[11] for the easy setting of any interior space or spatial lattice system.

3. Working places switchable to remote control are provided for about 15 persons, permitting optic and acoustic transmission of the tests. The desk suits modelling.

4. Test boxes can be moved in three dimensions. Different colours, surfacings or configurations can be projected and also physiological tests can be made.[12]

5. The room has acoustically dimensioned surfaces, not only for providing the minimum of noise level but also for an optimum assertion of the planned sound effects.

[11] The mentioned stretched steel net with magnetic connection is for bracing the mobile wall units.

[12] Test filmed in 1977 under the title "Space and Form" in the studio of the National Centre of Teaching Aids.

Equipment to be used

I. *Laboratory of light*

1. Rail channel system for the partial light fields (3-phase, made in Finland).
2. Adapters for the rail channel, for reflector amplifiers.
3. Profile reflectors 500 W/200 V, made in England.
4. Remote-controlled, motor-driven colour changing device to be mounted on the reflectors, with control board (6 units).
5. High-capacity slide and effect projector 2 kW/220 V, for 18 by 18 cm slides, with a halogen burner, accessories and optics.
6. Stroboscope projector with changeable frequency and remote control (4 units).
7. Transparent projecting surfaces made of a synthetic material.
8. Suspension device of 150 kp load capacity, to hold tableaux, plates.
9. Central electric switch and thyristor light control equipment, of 12 control circuits of 2 kW capacity each, having direct switching circuits, complete with a built-in colour organ and impulse control automatics.
10. Slide projectors with synchronizer to be connected to tape recorders.

II. *Electro-acoustic equipment*

1. A sonor echoing Philips MDR-2 with dynamic microphones.
2. Light organ, equipment for light effects.
3. Stereo-dynamic *Dual* record player.
4. Cassette tape recorder, stereo deck, system *Dolbi.*
5. Portable double-channel reporter tape recorder, with pilot signals, UHER report.
6. A hi-fi tape recorder for play-back operation.
7. 4-channel mixing amplifier AET-453.
8. 8-channel mixing table PKP-19 with independent channels, pilot signal transmission (e. g. in film projection, in using the camera).
9. Four stereo amplifiers 2×50 W AET-250.
10. Four rolling sounding boards 50 W each.
11. Four sounding boards 50 W each to be mounted on the wall.

Summary

Development of audio-visual media produced definite behaviour forms in many domains. Even architecture got seriously affected by e.g. influencing the ground plan and the appearance of school buildings.

Changes in features and quality of information media change also relations between man and technique as well as between man and man. It is an important hint to pedagogues

and architects to develop "soft-ware" for audio-visual media and its requirements have to be taken into consideration also in architecture.

The program of the planned Audio-Visual Studio of the Technical University, Budapest involves realization of an *open-system* visual laboratory.

Its function is threefold:

1. Fundamental research on perceptions (synesthetic, psychosomatic tests, etc.).
2. Development of programs for architectural practice (space modelling, study of lighting systems etc.).
3. Examination of visual aspects of educational work in architecture, demonstrations, programmed study systems etc.

Development of the methods has to rely on the conscious recognition of psychological and psychophysiological elements, likely to influence organization and design activity of the architect.

References

1. GÁBORJÁNI, P.: Technique and Education. Per. Pol. Arch. Vol. 20. No. 1.
2. GROH, J.: Visual Studies in the Training of Architects. Per. Pol. Arch. Vol. 20. No. 1.
3. HUNT, I. McV.: Intelligence and Experience, Ronald, 1961.
4. OSGOOD, C. E.: Method and Theory in Experimental Psychology. Oxford University Press, 1953.
5. REITMAN, W. R.: Cognition and Thought. Wiley, 1965.
6. SENDEN, M. V.: Space and Sight. Methuen, 1960.
7. WOODWORTH, R. S.—SCHLOSBERG, M.: Experimental Psychology. Holt, Rinehart and Winston, Inc. New York, 1961.
8. FEHÉR, E. M.: Von der Problematik der audio-visuellen Medien. Ontario, Manuscript, 1978.
9. GÁBORJÁNI, P.: Multi-purpose Visual Studio.* Mimeographic Study, Technical University, Budapest. 1972.
10. NÉMETH, A.: Industrial Design and Synesthesia; Facilities of the A. V. in the Fundamental Research of Synesthesia.* Manuscript. 1978.
11. JUHÁSZ, P.—PETHŐ, B.: Medical Psychology*. Chapter in "Applied Psychology". Gondolat Kiadó, Bp. 1973.
12. GÁBORJÁNI, P.: Colour Distorsions of Architectural Surfaces. AIC collection, Adam Hilger, London, 1973.
13. PATERSON, J.: Micro-Computers: a Revolution for Architects. RIBA Journal, 2. 1978. pp. 63—64.
14. MARKELIN, A.: Erfahrungen bei der Anwendung sensorischer Simulation im Städtebau. Bauwelt. Juli 1977. pp. 872--878.
15. GIBSON, J.: The Perception of the Visual World. Boston, Houghton Mifflin, 1950.
16. SKINNER, B. F.: The Science of Learning and the Art of Teaching. Review, pp. 86—97. 1954.
17. ÁKOS, K.: In the Turmoil of Times.* Gondolat Kiadó. Bp. 1978.

Péter GÁBORJÁNI-SZABÓ, H-1521, Budapest

* in Hungarian